Indian Central Cotton Committee
Annual Report of the Director
of Technological Laboratories
1936-37 to 1941-42

BOMBAY BRANCH
OF THE
ROYAL ASIATIC SOCIETY.
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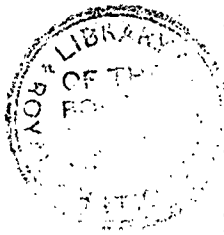

ANNUAL REPORT

OF THE

DIRECTOR

TECHNOLOGICAL LABORATORY

FOR THE

YEAR ENDING 31st MAY 1937

Price, 6 annas

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Post Box No. 1002, Bombay.

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Annual Report of the Director, Technological Laboratory, for the Year Ending 31st May 1937.

THE present report contains an account of the work done at the Laboratory from 1st June 1936 to 31st May 1937. In the past, the Annual Reports of the Laboratory covered the period 1st September to 31st August, but as this arrangement entailed the writing up of three separate reports, it has now been modified and in future a full account of the work of the Laboratory will be presented at the monsoon meeting of the Committee in an Annual Report, while the work done in the ensuing 5 months would in future be presented in an interim report at the cold weather meeting of the Committee. The only difference that this practice would make would be that for one year comparisons would be made between different months of the year. This feature, however, would last for only one year, after which the comparisons would be made as before between the same months.

The work of the Laboratory, as usual, will now be described under the following five heads :—

I. Spinning Laboratory.

II. Research Laboratory.

III. Moisture Testing Section.

IV. Publications.

V. General

I. SPINNING LABORATORY.

The following statement 'A' gives a summary of the agricultural, trade and standard cottons on which spinning tests were completed during the period under review. The statement also gives the names of the suppliers of the samples :—

STATEMENT 'A.'

BOMBAY.

(1) *The Cotton Breeder, Khandesh, Jalgaon.*—28 samples of Banilla and local cottons.

(2) *The Cottons Breeder, S.M.C., Dharwar.*—8 samples of crosses and selections.

(3) *The Principal Agricultural Officer, Padegaon.*—6 samples of Banilla from irrigation experiments.

(4) *The Cotton Overseer, Athani.*—4 samples of selections.

(5) *The Cotton Breeder, Surat.*—1 sample of B.D. 8 and 10 samples of selections.

(6) *The Cotton Breeder, Broach.*—7 samples of Local and selections.

(7) *The District Agricultural Overseer, Broach.*—One sample of B.D. 8 (Nabipur).

(8) *The Cotton Breeder, Viramgam.*—2 samples of Dalod Cotton.

SIND.

(1) *The Botanist in Sind, Sakrand.*—12 samples of various selections.

(2) *The Cotton Physiologist, Sakrand.*—14 samples of 285F-2 and 4F-98.

(3) *The Agricultural Chemist and Soil Physicist, Sakrand.*—9 samples of selections.

(4) *The Agricultural Officer in Sind, Mirpurkhas.*—9 samples of 4F crosses and selections.

(5) *Cotton Supervisor, Indus Right Bank, Dadu.*—3 samples of 289F-1 and 4F-98.

PUNJAB.

(1) *The Cotton Research Botanist, Lyallpur.*—8 samples of strains.

(2) *The B. C. G. A. (Punjab), Ltd., Khanewal.*—1 sample of K.T. 25.

CENTRAL PROVINCES.

(1) *The Economic Botanist for Cotton, C. P., Nagpur.*—15 samples of strains of Verum, Bani, etc.

MADRAS.

(1) *The Cotton Specialist, Coimbatore.*—1 sample of Podupatty cotton and 3 samples of Cambodia Strain 1267.

(2) *The Superintendent, Agricultural Research Station, Koilpatti.*—10 samples of Karunganni and selections.

(3) *The Farm Manager, Nandyal.*—1 sample of selection.

(4) *The Superintendent, Dry Farming Station, Bellary.*—3 samples of Co. 2 with different dates of sowing.

(5) *Senior Cotton Assistant, Guntur.*—5 samples of strains.

(6) *The Cotton Assistant, Perundurai P. O.*—3 samples of crosses and Nadam control.

(7) *The Agricultural Demonstrator, Bellary.*—1 sample of H.I.

(8) *The Agricultural Demonstrator, Tadpatri.*—1 sample of H.I.

(9) *The Agricultural Demonstrator, Adoni.*—1 sample of H.I.

(10) *The Agricultural Demonstrator, Guntakal.*—1 sample of H.I.

(11) *The Assistant Director of Agriculture, Vizagapatam.*—1 sample of Kondapatty cotton.

MISCELLANEOUS.

(1) *The Director, Institute of Plant Industry, Indore.*—1 sample of mixture and 7 samples of strains.

(2) *The Cotton Research Botanist, Parbhani, Deccan.*—16 samples of Gaorani and Parbhani selections.

(3) *The Inspector, Cotton Seed Distribution, Kopbal.*—2 samples of Jayawant cotton.

(4) *The Crop Botanist, Malwa Division, Ujjain.*—37 samples of Malvi and other strains.

(5) *The Second Economic Botanist, Dacca.*—3 samples of 289F grown in Bankura and Midnapur.

(6) *The Superintendent, Jagudan Farm, Jagudan.*—8 samples of Segregates, Wagad and Local cottons.

(7) *The Junior Inspector of Agriculture, Kodinar, Verawal.*—1 sample of Buri cotton.

(8) *The Extra Assistant Director of Agriculture, N.W.F.P., Peshawar.*—2 samples of Marden and Pishtakara.

(9) *The Senior Botanist, Department of Agriculture, Uganda.*—8 samples of Uganda selections.

Standard cottons.—Details given on page 9.

Trade samples.—Details of the samples supplied by the East India Cotton Association, Bombay, and the Millowners' Associations of Bombay and Ahmedabad are given on page 11.

The following Tables I, II and III give the distribution of samples, lots and counts spun and tested in the Laboratory in each year since 1924. It should be remembered in this connection that the figures for 1924-25 to 1935-36 relate to the year from 1st September to 31st August, while those

for 1936-37 refer to the year from 1st June to 31st May. The reasons for introducing this change have already been explained in my introductory remarks :—

TABLE I.—*Distribution of Samples Spun*, 1924-37.

Province.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.
Bombay	18	26	22	22	28	66	89	69	143	111	97	59	67
Sind	..	..	..	..	..	..	..	..	..	..	..	28	47
Punjab	14	1	..	..	42	30	10	44	55	42	23	71	9
United Provinces ..	7	..	6	11	9	7	16	7	12	6	7	11	..
Madras	2	19	50	23	30	51	66	15	28	101	30	51	31
Central Provinces ..	2	..	3	2	2	5	3	3	5	9	9	10	15
Miscellaneous ..	3	11	..	6	6	27	28	33	75	97	85	100	85
Total ..	46	57	81	64	117	186	212	171	318	366	251	330	254
Standard Cotton Tests	8	54	49	64	33	34	27	18	18	16	18	23	15
Trade Tests and Special Tests ..	..	..	..	..	..	37	89	134	125	166	131	143	162
Grand Total ..	54	111	130	128	150	257	328	323	461	548	400	496	431

TABLE II.—*Distribution of Lots Spun*, 1924-37.

Province.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.
Bombay	36	52	44	44	53	107	90	69	143	111	97	61	69
Sind	..	..	..	..	..	..	..	..	..	..	..	28	47
Punjab	26	4	..	..	83	41	10	44	55	42	23	71	9
United Provinces ..	14	..	12	22	18	14	16	7	12	6	7	11	..
Madras	4	38	100	46	60	85	66	16	28	101	30	51	31
Central Provinces ..	3	..	6	4	4	10	4	3	5	9	9	10	15
Miscellaneous ..	3	22	..	12	9	33	29	33	75	97	85	100	85
Total ..	86	116	162	128	227	290	215	172	318	366	251	332	256
Standard Cotton Tests	34	176	142	178	68	64	54	36	36	32	36	46	30
Trade Tests and Special Tests ..	..	..	..	..	..	37	119	186	129	175	175	175	182
Grand Total ..	120	292	304	306	295	391	388	394	483	573	462	553	468

TABLE III.—*Distribution of Yarns Spun*, 1924-37.

Province.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.
Bombay	103	152	132	132	159	322	253	203	430	332	292	190	217
Sind	..	..	..	..	..	..	..	..	..	..	..	84	143
Punjab	106	14	..	..	254	113	31	136	165	127	72	220	28
United Provinces ..	27	..	36	66	54	42	40	22	32	18	21	35	..
Madras	12	108	278	138	180	255	199	53	85	303	90	151	89
Central Provinces ..	8	..	18	12	12	30	12	9	15	27	29	30	45
Miscellaneous ..	3	58	..	36	21	99	100	93	227	293	250	295	261
Total ..	259	332	464	384	686	861	635	516	954	1,100	754	1,005	783
Standard Cotton Tests	95	514	423	447	290	223	309	136	200	180	204	162	115
Trade Tests and Special Tests ..	..	..	..	..	..	80	343	502	256	499	810	609	649
Grand Total ..	354	846	887	831	976	1,164	1,287	1,154	1,410	1,779	1,768	1,776	1,547

It will be noticed that as compared with the corresponding figures for last year, the number of samples, lots and yarns spun during the period under review show a small decrease. This is due to the receipt of comparatively fewer samples from the Agricultural Departments in the year under review.

In addition to the samples received for fibre or spinning tests from different sources, the Laboratory also carries out tests on samples of yarn supplied by various mills and firms on payment of certain fees laid down by the Committee. During the period under review 58 samples of yarns were received from the mills and tested in the Laboratory.

The samples on which tests are made at the Laboratory form the subject of spinning test, fibre test or yarn test reports which are furnished to the suppliers of the samples. From among these, the reports on the samples supplied by the East India Cotton Association and the Millowners' Associations of Bombay and Ahmedabad, which represent either the fair average quality of the season's crop or the early arrivals of different varieties, are published in the form of Technological Circulars, which are freely distributed to the trade and the industry. Copies of these circulars are also sent to the foreign countries so that the consumers there may have authentic information regarding the waste losses and the spinning performance of the representative types of Indian cottons. Those reports, which deal either with the agricultural samples or with the samples tested on behalf of cotton mills or firms, are furnished only to the suppliers of the samples. The following Table IV gives a summary of the reports falling under each class, which were issued during the period under review together with the corresponding figures for the previous years :—

TABLE IV.—*Test Reports Issued*, 1924-37.

——	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.
Spinning Test Reports	7	19	19	22	21	63	92	60	87	121	112	135	129
Fibre Test Reports ..	1	1	5	1	7	4	7	19	30	18	19	44	52
Yarn Test Reports ..	..	..	..	1	4	4	2	3	5	3	7	13	10
Total Reports ..	8	20	24	24	32	71	101	82	122	142	138	192	191

It will be seen that the number of fibre test reports shows a small increase as compared with last year, that of spinning test reports shows a small decrease, while the total number of reports issued is practically the same as in the last year. It should be noted, as a measure of the increase in the work of the Laboratory, that no less than 200 reports of different kinds were issued in the year under review. This number is twice that for 1930-31 and nearly 10 times that for 1925-26. It may again be mentioned that the figures upto 1935-36 relate to the year from 1st September to 31st August, while those for 1936-37 refer to the year from 1st June to 31st May.

The permanent staff of the Laboratory remained the same as during the last year and the following table gives the strength of the staff from year to year since 1924. The figures up to 1936 are for the year ending 31st August each year, while those for 1937 are for the year ending 31st May 1937 :—

TABLE V.—*Permanent Staff*, 1924-37.

——	1924.	1925.	1926.	1927.	1928.	1929.	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.
Technical Staff	8	11	20	24	27	27	32	32	32	33	34	34	34	34
Research Students	1	3	6	4	3	2	1	1	..	..	..	..	2	2
Fumigation Chemists.. ..	..	..	2	4	2	2	2	2	2	2	2	2	2	2
Total ..	9	14	28	32	32	31	35	35	34	35	36	36	38	38

Most of the samples detailed above were subjected to the routine tests of the Laboratory, but there are some amongst them which deserve a special mention. These be briefly described below :—

(*a*) AGRICULTURAL SAMPLES.

(1) *Sowing date experiments in Bellary.*—Three samples of Cambodia Co. 2, sown on 1st July, 1st August and 1st September were received from the Superintendent, Dry Farming Station, Bellary. The results of the tests carried out on these samples showed that those sown late gave a better performance than those sown early. It should, however, be mentioned that similar tests made on samples of the same cotton grown in Coimbatore in the two seasons, 1927-29, yielded the opposite results, showing that late sowing had an adverse effect on the spinning quality of the cotton grown in Coimbatore. In view of the conflicting nature of the two sets of results, a recommendation was made in the spinning test report that samples of this cotton should be grown in replicated plots in the two places so that more definite conclusions regarding the effect of early and late sowing may be drawn.

(2) *Effect of passage of kapas in a Crighton opener before ginning.*—Three samples of Cambodia Strain 1267 were received from the Cotton Specialist, Coimbatore. One of them was a control sample, while the *kapas* of the second had been passed once through the opener of a Porcupine type and the *kapas* of the third had been passed twice through the same opener before ginning. The spinning tests carried out on these samples showed that differences in yarn strength between the three samples were within the sampling error and that the only noteworthy advantage of giving the pre-opening treatment to the *kapas* was to reduce the blow-room loss of the lint obtained therefrom by about 1 per cent.

(3) *Bijapur Kumpta samples.*—The produce of certain villages, namely, Honwad, Babanagar, Bijaragi and Kanamade was not allowed to be sold in the Athani market in the Dharwar-Kumpta area, and could only be

sold in the Bijapur market though the latter is situated at a greater distance from the villages. This market, furthermore, is noted for short-staple cottons as compared with the Athani market and therefore the villagers complained that adequate prices were not offered for their produce in the Bijapur market. They approached the Department of Agriculture, Bombay Presidency, for licences to sell their produce in the Athani market. Accordingly, samples of cotton grown in these villages were received at the Laboratory and subjected to the necessary tests. It was found that only the sample from Babanagar village came up to the standard of the commercial Kumpta, while the other three samples from Honwad, Bijaragi and Kanamadi were much inferior and came upto the level of the commercial Bijapur crop. These findings were communicated to the Department of Agriculture, Bombay Presidency, for departmental action in the matter.

(4) *Bengal 289F Cotton.*—Recently efforts have been made to grow 289F cotton in Bengal. Tests have already been made and reports issued on samples grown in Dacca and Bankura. During the period under review another 2 samples of 289F were received from Midnapore, one of which represented clean, while the other represented unclean lint. The results of tests carried out on these samples showed that the cleaning process adopted had a deleterious effect on the staple of this cotton as a result of which its yarn strength was reduced by a small amount.

(5) *Cottons from the North-West Frontier Province.*—The cultivation of cotton has also extended to the other end of India in the N.W.F.P. and organised efforts are being made to evolve varieties suited to the climatic and soil conditions of this Province. During the period under review two samples were received for spinning tests and were found to be suitable for spinning upto 11's standard warp counts. Furthermore, a large number of samples were also received for fibre tests and it is interesting to note that these contain varieties of Egyptian cottons grown in the N.W.F.P. from imported seed. The progress of these types will be watched with interest.

(6) *Podupatty cotton from Malabar.*—Another example of the extension of the area from which cottons are being sent for tests to the Laboratory was afforded by a sample of cotton received from Malabar for the first time. The spinning tests carried out on this sample showed it to be suitable for spinning upto 11's standard warp counts.

(7) *Effect of differential irrigation on the quality of cotton.*—These tests have been in progress at the Laboratory for sometime past and samples grown with different amounts of irrigation have been received from Coimbatore, Sakrand and Lyallpur. During the period under review samples of Banilla cotton grown at Padegaon with different amounts of irrigation were also received and tested. It is found that so far as this tract is concerned the control sample, which was irrigated according to the *Zamindari* system,

gave better results than any other sample grown with a variation in the frequency or the intensity of irrigation.

(8) *Uganda cottons.*—In accordance with the decision of the Committee that 8 samples of Uganda cotton may be tested at the Laboratory for the Uganda Government free of charge, tests were made on 8 samples supplied during the year by the Department of Agriculture, Uganda. It should be noted that the Department of Agriculture did not supply a sample of N. 17 cotton which is a control sample for the Busoga and Lango districts of the Eastern zone. They have been requested to supply a sample of this cotton in future.

Furthermore, the Department sent two samples of B.P. 52 and S.P. 84 cottons to find out whether these cottons would be well received in the Indian market. The East India Cotton Association was requested to arrange for a valuation of the samples of these cottons by their Special Appeal Committee on African Cottons and they reported that in their opinion these cottons are not suitable for the Indian market.

(9) *Hyderabad-Gaorani 4 and Gaorani 6 cottons.*—As it is intended that one of these two new varieties, evolved under the Hyderabad Botanical Scheme, should replace Umri Bani over a considerable area in Hyderabad, Deccan, tests were arranged in a local mill on these two cottons in addition to those carried out at the Laboratory. The mill tests, agreeing with the Laboratory tests, showed that Gaorani 6 was capable of giving a better performance than Gaorani 4. In view of the future importance of this cotton, tests were also made at the Laboratory by mixing Gaorani 6 with 1027 A.L.F., Wagad 8 and Raman (Bengals) in the proportion of 33 to 66 per cent. These tests showed that although 1027 A.L.F. is somewhat longer than Gaorani 6, no special advantage in yarn-strength was obtained by mixing these cottons, that Gaorani 6 behaved in a perfectly regular manner when mixed with Wagad 8, which is about 10 per cent. shorter, but that its behaviour was very irregular when mixed with Raman which is about 20 per cent. shorter and very much coarser.

(10) *Long staple Sind-Egyptian and Egyptian cottons.*—In view of the increasing importance of long staple cottons grown in the Sukkur Barrage area, tests were made at the Laboratory on Sind Sea Island, Boss III and Ashmouni and their performance was compared with some of the Egyptian long staple varieties. The results of these tests were considered by the Technological Research Sub-Committee, who recommended that in order to take into account the seasonal variation of the cottons, these tests should be repeated on the 1936-37 crop. Accordingly, samples of these cottons have been requisitioned and will be tested with the above-mentioned object.

(*b*) STANDARD COTTONS

The annual *bulletin* containing the results of tests on the standard Indian cottons of the 1935-36 season, together with the results for the

previous seasons, was issued in July 1936. The following statement gives the names of the standard cottons of the 1936-37 season received for the tests at the Laboratory during the period under review :—

BOMBAY.

1. Jayawant (Kumpta).
2. Gadag 1 (Dharwar-American).
3. Surat 1027 A.L.F.
4. Wagad 8 (Dholleras).

SIND.

5. Sind-Sudhar (289F-1).
6. Sind N.R. (W.N. 27).

PUNJAB.

7. Punjab-American 4F.
8. Punjab-American 289F.
9. Mollisoni (Bengals).

UNITED PROVINCES.

10. Aligarh A. 19 (Bengals).
11. C. 402 (U.P.).

CENTRAL PROVINCES.

12. (*a*) Verum 262 (Nagpur).
    (*b*) Verum 262 (Akola).
13. V. 434 (Akola).
14. Late Verum (Nagpur).

HYDERABAD.

15. Umri Bani.

MADRAS.

16. Cambodia Co. 2 (Cambodia 440).
17. Nandyal 14 (Northerns).
18. Hagari 1 (Westerns).
19. Karunganni C. 7.
20. KPT. I. (Koilpatti).

During the period under review tests were completed and 4-page technological circulars were issued on the following standard cottons of the 1936-37 season :—

1. Verum 262 (Akola).
2. V. 434 (Akola).
3. Umri Bani.
4. Verum 262 (Nagpur).
5. Late Verum (Nagpur).
6. Punjab-American 289F.
7. Sind-Sudhar (289F-1).
8. Surat 1027 A.L.F.

The tests on the remaining standard cottons are in progress and the results for all will be embodied in the Technological Reports on Standard Indian Cottons, 1937, in due course.

It should be mentioned that according to the information received from the Department of Agriculture, Madras Presidency, Karunganni C. 7 is now being steadily replaced by a new variety called KPT. 1 which has proved a better yielder and has given a higher spinning performance. Therefore, on the recommendation of the Director of Agriculture, Madras Presidency, KPT. 1 will in future be treated as a standard Indian cotton. However, in view of the fact that a good deal of data regarding the fibre-properties, spinning performance, field behaviour, etc., of Karunganni C. 7 is already available for the last 12 seasons and that this data may prove very useful in a statistical analysis, the Department of Agriculture, Madras Presidency, has been requested to continue to grow a small quantity of Karunganni C. 7 in future years and to supply to the Laboratory, samples of this cotton for tests.

(c) TRADE SAMPLES AND SAMPLES FROM PRIVATE MILLS.

The Indian Central Cotton Committee has entered into an arrangement with the East India Cotton Association that it will carry out at its Technological Laboratory spinning tests on samples of fair average quality of representative trade varieties of Indian cottons. It has also made an arrangement with the Millowners' Associations of Bombay and Ahmedabad that it will undertake tests at its Laboratory on early arrivals of the more important trade varieties of India. The results of these tests are published in 2-3 page technological circulars which are freely distributed among the trade. During the period under review tests under this head were made on the following samples, while a list of the technological circulars issued in this period will be found under the head " Publications " :—

1. *List of samples supplied by the East India Cotton Association, Ltd., Bombay.*

1.	Dholleras	(1935-36).	16.	A.R. Busoga	(1935-36).
2.	Broach (Palej)	(,,).	17.	A.R. Kampala	(,,).
3.	Jagadia	(,,).	18.	Westerns Javaria	(,,).
4.	Berar	(,,).	19.	Kumpta	(,,).
5.	Khandesh	(,,).	20.	Berar	(1936-37).
6.	Farm Westerns	(,,).	21.	C.P. No. 1	(,,).
7.	Upland	(,,).	22.	Khandesh	(,,).
8.	Kadi-Viramgam	(,,).	23.	Surat	(,,).
9.	Bijapur	(,,).	24.	Jagadia	(,,).
10.	Kalagin	(,,).	25.	Broach	(,,).
11.	Bagalkote	(,,).	26.	Muttia	(,,).
12.	Cambodia	(,,).	27.	Nanded	(,,).
13.	Tinnevelly	(,,).	28.	Navsari	(,,).
14.	Karunganni	(,,).	29.	Punjab-American	(,,).
15.	A.R. Jinja	(,,).	30.	Kadi-Viramgam	(,,).

2. *List of samples supplied by the Bombay Millowners' Association, Bombay.*

1.	African Busoga	(1935-36).	11.	Ujjain (Mandsaur)	(1936-37).
2.	African Jinja	(,,).	12.	Moglai	(,,).
3.	African Kampala	(,,).	13.	Farm Westerns	(,,).
4.	Miraj (Shedbal)	(,,).	14.	Broach (Palej)	(,,).
5.	Tiruppur Cambodia	(,,).	15.	Bailhongal	(,,).
6.	Karunganni	(,,).	16.	Hubli Kumpta	(,,).
7.	Northern Cambodia	(,,).	17.	Surat	(,,).
8.	Bengals (Hansi)	(1936-37).	18.	Kampala	(,,).
9.	Khandesh (Saudha)	(,,).	19.	Jinja	(,,).
10.	Ujjain (Ujjain)	(,,).	20.	Busoga	(,,).

3. *List of samples supplied by the Ahmedabad Millowners' Association.*

1. Jagadia. 2. Kadi. 3. Bawla.

As in the past, the results obtained for the tests on the trade varieties of 1935-36 season, together with the results of the previous seasons, were embodied in the Technological Reports on Trade Varieties of Indian Cottons, 1936, which was issued in November 1936.

In addition to these tests on trade varieties, the Laboratory continued to receive from firms and cotton mills samples of lint or yarn for various

tests. During the period under review, 6 samples were received for spinning tests, 24 for fibre tests, 23 for yarn tests, 41 for moisture tests, one for Shirley Analyser test, and one for blow-room test. Reports containing the results of these tests were sent to the suppliers of the samples. Among the samples tested for the trade the following deserve a special mention :—

(1) *Broach (Palej) and Broach (Amod).*—The East India Cotton Association sent 4 samples of these cottons with a request that tests may be made on them to help the Appeal Committee of the Association in checking up their decision on these cottons. The Association has made similar use of the facilities afforded by the Laboratory on previous occasions and these instances show an interesting development of the Laboratory's activities which is directly and immediately helpful to the trade.

(2) The Bombay Millowners' Association sent 21 bundles of yarns of different counts to the Laboratory with the request that their actual counts may be determined at (*a*) the prevailing humidity, and (*b*) after drying them completely in a conditioning oven. The object of these determinations was to find out the extent of malpractice in the matter of differences between the actual and nominal counts and to ascertain whether or not these differences lay within permissible limits. A report on these tests was sent to the Millowners' Association.

(3) *Afghan cotton.*—A sample of a cotton grown in Afghanistan was sent by a firm and tested for the first time at the Laboratory. It possessed a staple length of 0.86″ and yielded 30's warp of a satisfactory strength.

At its last meeting, the Technological Research Sub-Committee appointed a small Sub-Committee to go into the question of the fees charged for the various tests carried out at the Laboratory. This Sub-Committee met on 3rd May 1937 and recommended a reduction in the fee of many tests in order to popularising them among the industry and to induce the mills to make still greater use of the manifold facilities afforded by the Laboratory. The Report of the Sub-Committee was approved by the Standing Finance Sub-Committee at its meeting held on 21st May 1937. The modified schedule of fees is reproduced below :—

NEW SCALE OF FEES FOR TESTS CARRIED OUT AT THE TECHNOLOGICAL LABORATORY.

		New Scale. Rs.	a.
(1)	*Fibre or Yarn Test :*		
	(*a*) Mean fibre-length	5	0
	(*b*) Fibre-weight per inch	5	0
	(*c*) Fibre-strength	7	8
	(*d*) Lea test	5	0
	(*e*) Ballistic test	5	0
	(*f*) Single thread test	5	0
	(*g*) Twist	5	0

		New Scale. Rs.	a.
(2)	*Fibre and Blow-room Test :*		
	(*a*) Fibre tests as for (*a*)—(*c*) above.		
	(*b*) Blow-room only	10	0
(3)	*Full Test :*		
	(*a*) Fibre tests as for (*a*)—(*c*) above.		
	(*b*) Spinning test on cotton	35	0
	(*c*) Spinning test on sliver after combing it	25	0
	(*d*) Spinning test on combed cotton	45	0
	(*e*) Tests in addition to the ordinary 3-roller system .. .. (per system)	5	0
(4)	*Variety of Cotton (Broad Classification)*	25	0
(5)	*Identification of Fibre (Microscopic Test)*	15	0
(6)	*Percentage of Size*	5	0
(7)	*Percentage of Grease*	5	0
(8)	*Percentage of Free Acid*	10	0
(9)	*Presence of Mildew in Cloth*	5	0
(10)	*Causes of Mildew Growth*	30	0
(11)	*Percentage of Immature Fibres :*		
	(*a*) in lint or *kapas*	7	8
	(*b*) In yarn or cloth	10	0
(12)	*Wax Content :*		
	(*a*) 1st sample..	7	8
	(*b*) Each additional sample provided it is sent at the same time	5	0
(13)	*Determination of Mechanical Injury to Fibre*	10	0
(14)	*Cloth Samples :*		
	(*a*) Actual counts	5	0
	(*b*) Actual twist	10	0
	(*c*) Single thread strength	10	0
(15)	*Moisture Tests :*		
	(*a*) 1st sample	5	0
	(*b*) Each additional sample provided it is sent at the same time	2	8
(16)	*Shirley Analyser Tests*	5	0
(17)	*Tests for Analysis of Union Fabric*	10	0

(*d*) TECHNOLOGICAL TESTS

(1) *Spinning tests on mixtures of staple fibres and Indian cottons.*—The past few years have witnessed a considerable increase in the world's production and consumption of staple fibre and the progressive Indian mills, in common with mills in other parts of the world, have been using staple fibre in increasingly large quantities to produce new effects in the finished material. In view of the growing importance of these fibres, it was felt desirable that spinning tests should be carried out at the Technological Laboratory on mixtures of some Indian cottons with different types of staple fibres. The cottons selected were Jayawant and Cambodia Co. 2 and these were mixed with three types of staple fibres in different proportions. The results of these tests were published during the period under review in the form of a Technological Bulletin, a summary of which will be found under the head " Publications."

(2) *Further tests on Indian cottons with different systems of high draft spinning.*—The Laboratory has already completed two investigations on the application of different systems of high draft spinning to Indian cottons and their mixings. Since the publication of the last Bulletin on this subject, the Laboratory acquired three more systems of high draft spinning, and it was, therefore, felt that this series of investigations should be extended by including in it these new systems. The cottons selected for this purpose were Superfine Oomra, P.A. 4-F and Cambodia Co. 2 and tests were made on pure cottons as well as on mixtures prepared from them. In all 9 different modes of spinning, including 5 systems of high draft spinning, were employed and the results of this investigation were published during the period under review in a Technological Bulletin, a summary of which will be found under the head " Publications."

(3) *Effect of storage of seed cotton prior to ginning.*—A bulletin containing the results of some experiments on this subject was published in January 1935. The Technological Research Sub-Committee, while considering the results embodied in this bulletin, recommended that the scope of this investigation might be extended by increasing the period of storage from 4 weeks to about 4 months and by including among these cottons a cotton from Gujerat. Accordingly, samples of P.A. 289-F, P.A. 4-F, Mollisoni and Wagad 8 were requisitioned for this purpose. In each case one sample of *kapas* was ginned immediately after picking when the *kapas* was dry, while the other sample was ginned after the *kapas* was stored in a dry place for 4 months in the case of the Punjab cottons and about 3 months in the case of the Gujerat cotton. During the period under review the tests on these samples were completed and the results obtained show that neither the wax content nor the fibre properties of any of the 4 cottons register any improvement as a result of the storage of *kapas*. The yarn-strengths of Wagad 8 and P.A. 289-F are practically unaltered as a result of the storage of *kapas*, while in the case of P.A. 4-F there is a small increase. Only Mollisoni shows an appreciable increase in the

sample which was ginned after 4 months' storage, but as this feature is not shared by the other cottons, it must be attributed to other causes. These results, therefore, agree with those of the previous investigation.

(4) *Limit spinning tests.*—The influence of twist on the strength of yarn spun from a cotton is a matter of very great importance to the practical spinner, and the Laboratory has already published a bulletin showing the variation with twist in the strength of yarns spun from Cambodia and Mollisoni with twist multipliers ranging from $3\frac{3}{4}$ to 5. Since then more tests along these lines have been made with the following cottons :—

1. P.A. 4-F.
2. Superfine Oomra.
3. Wagad 8.
4. A.R. Kampala.
5. A.R. Busoga.
6. A.R. Jinja.
7. Sind Sea Island.
8. Egyptian Giza 7.

The results of these tests, so far as available, were written up in the form of a paper, which was read at the First Conference of Scientific Research Workers on Cotton in India, a summary of which appears under the head "Publications."

(5) *Combing of Indian cottons.*—Since the publication of the first Bulletin on the subject in March 1935, several enquiries have been made showing the great interest taken by the spinners in this subject. It is also known that more and more Indian mills are installing combing machines in order to spin finer counts. In view of these facts, another investigation was undertaken in which the proportion of the comber waste was kept as low as possible so that the effect of the parallelisation of the fibres would be more important than that of partial elimination of short fibres. The Technological Research Sub-Committee, while considering this item at its last meeting, recommended that the comber wastes of the four cottons used in this investigation, namely, P.A. 289-F, Jayawant, Surat 1027 A.L.F., and Cambodia Co. 2, should be mixed with suitable short-staple cottons and the mixtures spun into coarse counts to take into consideration the utility of the comber wastes. During the period under review, this part of the investigation has been completed and a report on the subject will be written up in due course.

(6) *Effect of storage of lint on its quality.*—Sometime ago the Laboratory completed an investigation on the effect of storage of cotton in the open and inside a shed at Karachi. The results of this investigation were published in the form of a Technological Bulletin. Since then, samples of Mollisoni and P.A. 4-F were received from the Cotton Research Botanist, Lyallpur,

with a view to ascertaining the effect of storage over a period extending up to 4 years on the fibre properties and the spinning quality of these two cottons. For this purpose commencing from 1932, two bales of each cotton were prepared in each year; of these one was sent to the Laboratory while the other was stored in a dry place at Lyallpur. Consequently, during the current year bales of the two cottons stored for periods ranging from one to four years were available and were sent to the Laboratory for tests. During the period under review the tests on these samples were completed and the results showed that if these cottons are picked, ginned and pressed in a fairly clean condition and are stored in a reasonably dry atmosphere, the loss in quality, which is mostly due to a change in colour, is quite small even after 4 years' storage. They also showed that P.A. 4-F is somewhat more susceptible than Mollisoni to the adverse effects of storage over a long period. They further showed that for shorter periods of storage there may even be a small increase in yarn strength, which, to some extent, may compensate for the loss in colour, especially in the manufacture of bleached goods. It should, however, be noted that these results only apply to the particular conditions of storage holding for the samples under reference and that if the samples had been stored in a humid atmosphere or due care had not been exercised in their picking and ginning, the above conclusions would not hold. Furthermore, the samples which formed the material for these tests were pressed into small bales in which the density of compression is much less than in a normal bale; though this factor, by itself, would not perhaps influence the results, as another investigation has shown that the spinning performance of a cotton is practically independent of the density of compression between the range of 20 lbs. per cu. ft. to 40 lbs. per cu. ft.

(7) *Quality of lint in relation to ginning factors.*—The Laboratory has already completed one investigation in which the effect of some of the ginning factors in a roller gin and a saw gin on the fibre properties and spinning performance of cotton was studied. Another investigation on these lines has been undertaken in which the effect of moving knife setting, speed, amount of moisture in *kapas*, and the type of material of which the roller washers are made in a roller gin on the fibre properties of Cambodia Co. 2, Karunganni and Boss III are being studied in a greater detail than before. In view of the fact that in the ginning process the outturn per hour per inch of the roller length and the amount of power consumed are of great practical importance, arrangements have been made for the study of these two factors as well. Furthermore, in view of the fact that the hygroscopic condition of *kapas* has an important bearing on its ginning behaviour, arrangements have also been made for the determination of the moisture content of the *kapas* and lint of each sample.

(8) *Deterioration of Broach (Pale) cotton with lapse of time.*—This investigation was undertaken at the request of the East India Cotton Association and divided itself into two parts. Mr. Gulati made a critical study of the bacteria and fungi associated with this cotton, which are found to be mainly responsible for its deterioration in colour with time. An

account of this part of the investigation was read before the First Conference of Scientific Research Workers on Cotton and a summary of it will be found under the head "Publications." The second part of this investigation consisted in making spinning tests on samples of cotton drawn from time to time. In view of the fact that B.D. 8 has proved itself a suitable substitute in the Broach area, a similar investigation on this cotton has been started in order to find out the degree of susceptibility of this cotton to deterioration with lapse of time and to compare it with that of Broach cotton.

(9) *Effect of pre-humidification on the spinning performance of a cotton.*—These tests have been made on bales of Broach (Palej) cotton pressed with different degrees of pre-humidification and on samples of Amraoti cotton treated in the same manner. The results obtained are described in separate reports.

II. RESEARCH LABORATORY.

Fibre Testing Section.—This section was kept fully occupied during the period under review by the determination of fibre properties of the samples received in the Laboratory for spinning tests and fibre tests. The following statement gives the distribution of the small size samples on which fibre tests only were carried out at the Laboratory in addition to those on which both fibre and spinning tests were made :—

1. *The East India Cotton Association, Ltd., Bombay.*—56 samples.
2. *A firm, Bombay.*—8 samples.
3. *A firm, Bombay.*—9 samples of Punjab-American cotton.
4. *A firm, Bombay.*—1 sample of Bavla cotton.
5. *The Secretary, Indian Central Cotton Committee, Bombay.*—3 samples of American standards.
6. *A firm, Bombay.*—2 samples of drawing slivers.
7. *A cotton mill, Bombay.*—2 samples of Egyptian cotton.
8. *The Economic Botanist to the Government of Bombay, Poona.*—4 samples of lint.
9. *The Cotton Breeder, South Gujarat, Surat.*—9 samples of selections.
10. *The Cotton Breeder, Broach.*—11 samples of crosses.
11. *The Agricultural Chemist and Soil Physicist, Sakrand.*—17 samples from manurial experiments.

12. *The Director of Agriculture, N.W.F.P., Peshawar.*—2 samples of Ashmouni cotton.

13. *The Extra Assistant Director of Agriculture, N.W.F.P., Serai Naurang (Bannu).*—9 samples of Giza and other strains.

14. *The Cotton Specialist, Coimbatore.*—12 samples of Co. 2.

15. *The Director of Agriculture, Baroda State.*—2 samples of 1027 A.L.F.

16. *The Cotton Research Botanist, Parbhani.*—6 samples of Gaorani and Parbhani Strains.

17. *The Manager, Rai Sankli Taluka, Wadhwan City.*—3 samples.

18. *A firm, Mirzapur, U. P.*—1 sample of woollen yarn.

19. *The Director, Institute of Plant Industry, Indore.*—18 samples of Indore and Malvi selections.

From among the samples detailed in the above statement mention may be made of the following which deserve a special notice :—

(1) *American Standards.*—Three samples representing the American Standards, 1", 1⅛" and 1 3/16" were received from the Secretary's office and tested for fibre length. It was found that whereas the mean fibre-length of the 1" and 1⅛" standards was about 5 per cent. less than the nominal value, that of the 1 3/16" standard was practically the same as the nominal value. In view of the fact that generally the mean fibre-length, as found in the Laboratory, is somewhat less than the trade estimate, the 1 3/16" standard should be regarded as being slightly better than that indicated by its description.

(2) *A cotton sample from Poona.*—This sample was supplied by the Economic Botanist to Government of Bombay, Poona, and possessed several interesting features. It was longer in staple than most Indian cottons, yet its fibres were much more regular in length, its fibre strength was very high, probably the highest on record in the Laboratory, and it possessed a good percentage of mature fibres. However, as against these, it was found to be very coarse for its class and, in this respect, resembled more a Peruvian than an Indian cotton. On enquiry from the Economic Botanist it was found that it was an indigenous cotton grown from a plant selected by him.

(3) *Identification of cotton fibres in a woollen yarn.*—A sample of woollen yarn was supplied by a firm in Mirzapur with a request that the type of cotton present in the yarn may be identified. After making the necessary tests, it was found that the cotton present was Indian, most probably of a short staple and coarse type.

(4) *Samples grown with different manurial treatments.*—15 samples of cotton grown with different manurial treatments, viz., farmyard manure, castor cakes, compost with different amounts of phosphate, ammonium sulphate, were received from Sakrand and were tested for fibre-length, fibre-weight, fibre-strength, maturity percentage and for the amount of ash, phosphoric acid and nitrogen present in them. On working out a correlation coefficient between the chemical contents in each of the fibre properties, it was found that these coefficients were non-significant in most cases.

Mr. N. Hari Rao.—In addition to supervising the work of this section Mr. Hari Rao completed during the period under review his investigation on the effect of twist on the strength and extension of cotton fibre. The experimental part of this investigation had already been finished, leaving an account of it to be written up which was done during this period. This account has been sent to the *Journal of the Textile Institute* for publication and a summary of it appears under the head " Publications."

Mr. Hari Rao has now undertaken a systematic study of those cottons for which a striking discrepancy has been noticed between the fibre-properties and the spinning performance. It will be remembered that as a result of the work of Turner and Venkataraman, a formula for predicting the spinning performance of a cotton from its fibre-properties has been developed at the Laboratory. While this formula holds well for a majority of Indian cottons, about 20 per cent. of them do not come within its purview and the object of the present investigation is to ascertain, so far as possible, the reasons responsible for the discrepancy between the actual and the predicted values.

Physics Section.—During the period under review *Mr. R. S. Koshal* has completed his analysis of the effect of distribution of rainfall and temperature on the fibre-properties and spinning quality of the standard Indian cottons. The cottons which have been studied for this purpose are as follows :—

MADRAS :	1. Nandyal 14.
	2. Karunganni C. 7.
	3. Hagari 1.
U. P. :	4. C. A. 9.
C. P. :	5. Verum 262 (Nagpur).
	6. Verum 262 (Akola).
BOMBAY :	7. Surat 1027 A.L.F.
	8. Jayawant.
	9. Wagad 8.
	10. Gadag 1.

A complete account of this work which has involved the application of advanced statistical methods was written up during the period under review and read before the first Conference of Scientific Research Workers on Cotton in India. A summary of this important paper appears under the head " Publications."

Mr. Koshal has now undertaken a study of the relationship between the fibre-weight and fibre maturity of cotton fibre in closely related strains and the dependence of former on heredity, time of sowing, irrigation, etc. The material for these tests was kindly supplied by the Director, Institute of Plant Industry, Indore, and is the same as has been used for the study of fibre maturity by Mr. Gulati. This investigation is in progress.

Mr. C. Nanjundayya.—It will be recalled that some time ago an apparatus for the determination of mean fibre-length and fibre-weight per inch was designed at the Laboratory. While this apparatus gave these fibre-properties with great accuracy and rapidity, it suffered from the limitation that it did not yield the frequency distribution of fibres in a cotton sample from which the percentage of short hairs or the fibre-length irregularity could be calculated. This deficiency has now been removed during the period under review and a small attachment has been designed which can be fixed on this apparatus. This device makes it possible to determine the percentage of fibres of different lengths in the sample of cotton under test. Furthermore, Mr. Nanjundayya has spent part of the period in writing up an account of the investigation which was completed sometime ago in regard to the relationship between the strength and length grade of fibres in cottons covering a wide range of staple length. This account is nearly complete and will soon be sent up for publication. The rest of the period was spent by Mr. Nanjundayya in continuing his study of the relationship between the fibre-properties and the breaking strength and elastic properties of yarn at the point of rupture.

Dr. K. R. Sen continued his investigation on the part played by fibre-properties in determining the mixing quality of cotton. This investigation has resolved itself into two parts. The first part relates to the determination of the various fibre-properties such as mean fibre-length, fibre-length distribution, ribbon-width, number of convolutions, clinging power at two different angles of inclination, wax content, percentages of mature and immature hairs, fibre-strength and fibre-weight and their correlation with the tensile strength of the yarn spun from a mixture of two cottons. The second part covers a study of the relationship between clinging power on the one hand and convolutions, wax content, pressure and relative humidity on the other. The second part of the investigation has been completed during the period under review and an account of it is being written up for publication. The first part of the investigation is still under progress as some of the mixtures yet remain to be spun and tested in the Laboratory.

Microscopy Section.—During the period under review *Mr. A. N. Gulati* completed the writing up of the paper containing an account of the study

of bacteria and fungi associated with Broach cotton which were found to be mainly responsible for the deterioration of colour in this cotton. This paper was read at the First Conference of Scientific Research Workers on Cotton in India and a summary of it will be found under the head "Publications."

Mr. Gulati also continued with his investigation on the study of the effect of heredity, environment, irrigation, manurial treatment and rainfall on the degree of maturity of cotton fibre for which over 100 suitable samples were kindly supplied by the Director, Institute of Plant Industry, Indore. Mr. Gulati has also commenced an investigation similar to the one completed on Broach cotton on B.D. 8 cotton which is regarded as being suitable for replacing the former in the Broach tract. The scope of this investigation, however, has been extended by making strength tests on fibres at different periods during the growth of micro-organismal infection in order to study the weakening of the fibre as a result of bacterial and fungoid attack. These two investigations are in progress.

Chemistry Section.—Mr. D. L. Sen returned from study leave spent in England on the 15th September 1936 and was put on the work of studying the absorption of various dyes by Indian cottons which had hitherto been done by Mr. G. Rama Rao. An experimental study of the subject has been made with the help of a colorimeter, which has been designed and fitted up at the Laboratory and the Indian cottons selected for this purpose are :—

1. Surat 1027 A.L.F.
2. Cambodia Co. 2.
3. Punjab-American 4-F.
4. Sind Sea Island.
5. Mollisoni.
6. Umri Bani.
7. Wagad 8.

The absorption of various dyes by these cottons in the pure, soda boiled, kier boiled and bleached state are being studied by Messrs. D. L. Sen and G. Rama Rao.

Mr. D. L. Sen has also completed during the period under review the analysis of 15 samples of cotton grown with different types and dozes of organic and inorganic manures with a view to correlating the fibre-properties of this cotton with its chemical constituents. In this work he was assisted by Mr. N. Hurry, who also rendered assistance to Dr. K. R. Sen in his work.

Mr. M. U. Parmar has continued his investigation on the effect of kier boil treatment on the strength and elasticity of yarns spun from different

Indian cottons. He has completed this investigation on P.A. 289F and 1027 A.L.F. and is now extending it to Jayawant cotton. The tests of strength and elasticity for these cottons have already been completed and the measurements for fluidity of the cuprammonium solutions are now being undertaken as standard viscometers have only just now been received from England. I should, in this connection, like to express my gratefulness to Prof. Scholefield and Mr. H. A. Turner of the Manchester College of Technology, for their very great kindness in not only obtaining for me the viscometers for this investigation but also for standardising them in their Laboratory.

III. MOISTURE TESTING SECTION.

Mr. P. S. Sambamurthi, Junior Tester, carried out the work of this Section and during the period under review tested 20 samples for moisture content as detailed below :—

Appeal Committee	1
Trade	19

The total number of samples tested in this section upto 31st May 1937 is 790.

IV. PUBLICATIONS.

The following are the publications of the Laboratory issued during the period under review :—

I. *Technological Bulletins, Series A, Nos.* 33 *to* 37.

(1) Technological Bulletin, Series A, No. 35, " Technological Reports on Trade Varieties of Indian Cottons, 1936," by Nazir Ahmad, M.Sc., Ph.D., F.Inst.P.

(2) Technological Bulletin, Series A, No. 36, " Spinning Tests on Mixtures of Staple Fibres and Indian Cottons," by Nazir Ahmad, M.Sc., Ph.D., F.Inst.P.

(3) Technological Bulletin, Series A, No. 37, " Further Tests on Indian Cottons with Different Systems of High Draft Spinning," by R. P. Richardson, F.T.I., and Nazir Ahmad, M.Sc., Ph.D., F.Inst.P.

II. *Technological Bulletin, Series B, No.* 21-22.

" The Effect of Twist on the Strength and Length of Cotton Fibre," Harirao Navkal, M.Sc., and Nazir Ahmad, M.Sc., Ph.D., F.Inst.P.

Technological Bulletins, Series A, No. 33 and 34, and Series B, No. 21, have been summarised in the previous Annual Report.

In addition to these Bulletins, the following three papers were read at the First Conference of Scientific Research Workers on Cotton in India, held on the 4th, 5th and 6th March 1937 :—

(1) " Effects of Rainfall on the Quality of Indian Cottons," by R. S. Koshal, M.Sc., and Nazir Ahmad, M.Sc., Ph.D., F.Inst.P.

(2) " Influence of Twist on Yarn Strength," by V. Venkataraman, M.A., and Nazir Ahmad, M.Sc., Ph.D., F.Inst.P.

(3) " Deterioration of Broach Palej Cotton on Storage," by A. N. Gulati, M.Sc.

III. *Technological Circulars Nos.* 241 *to* 301, *as under :—*

Circular No.	Title.	Date of publication.
241	Spinning Test Report No. 719 on samples of Dholleras, 1935-36	June 1936.
242	Spinning Test Report No. 728 on samples of Broach, 1935-36	July 1936.
243	Spinning Test Report No. 729 on samples of Jagadia, 1935-36	July 1936.
244	Spinning Test Report No. 730 on samples of Berar, 1935-36	July 1936.
245	Spinning Test Report No. 733 on samples of African Busoga, 1935-36	July 1936.
246	Spinning Test Report No. 734 on samples of Jinja, 1935-36	July 1936.
247	Spinning Test Report No. 735 on samples of Khandesh, 1935-36	July 1936.
248	Spinning Test Report No. 736 on samples of Kampala, 1935-36	July 1936.
249	Spinning Test Report No. 739 on samples of Miraj, 1935-36	July 1936.
250	Spinning Test Report No. 740 on samples of Tiruppur Cambodia, 1935-36	July 1936.
251	Spinning Test Report No. 742 on samples of Karunganni, 1935-36	July 1936.
252	Spinning Test Report No. 743 on samples of Northern Cambodia, 1935-36	July 1936.
253	Spinning Test Report No. 754 on samples of Farm Westerns, 1935-36	August 1936.
254	Spinning Test Report No. 755 on samples of Upland, 1935-36	August 1936.
255	Spinning Test Report No. 756 on samples of Kadi-Viramgam, 1935-36	August 1936.
256	Spinning Test Report No. 757 on samples of Bijapur, 1935-36	August 1936.
257	Spinning Test Report No. 758 on samples of Kalagin, 1935-36	August 1936.
258	Spinning Test Report No. 778 on samples of Bagalkote, 1935-36	October 1936.

Circular No.	Title.	Date of publication.
259	Spinning Test Report No. 779, on samples of Cambodia, 1935-36	October 1936.
260	Spinning Test Report No. 781 on samples of Tinnevelly, 1935-36	October 1936.
261	Spinning Test Report No. 782 on samples of Karunganni, 1935-36	October 1936.
262	Spinning Test Report No. 784 on samples of A.R. Jinja, 1935-36	October 1936.
263	Spinning Test Report No. 786 on samples of A.R. Busoga, 1935-36	October 1936.
264	Spinning Test Report No. 789 on samples of A.R. Kampala, 1935-36	October 1936.
265	Spinning Test Report No. 791 on samples of Westerns Javaria, 1935-36	October 1936.
266	Spinning Test Report No. 795 on samples of Kumpta, 1935-36	October 1936.
267	Technological Reports on Verum 262 (Akola), 1936-37	November 1936.
268	Technological Reports on Verum 434 (Akola), 1936-37	November 1936.
269	Technological Reports on Umri Bani, 1936-37 ..	December 1936.
270	Spinning Test Report No. 798 on samples of Bagalkote, 1936-37	December 1936.
271	Spinning Test Report No. 799 on samples of Khandesh, 1936-37	January 1937.
272	Spinning Test Report No. 801 on samples of Ujjain, 1936-37	January 1937.
273	Spinning Test Report No. 802 on samples of Mandsaur, 1936-37	January 1937.
274	Spinning Test Report No. 805 on samples of Moglai, 1936-37	January 1937.
275	Technological Report on Verum 262 (Nagpur), 1936-37	January 1937.
276	Spinning Test Report No. 808 on samples of Berar, 1936-37	February 1937.
277	Spinning Test Report No. 809 on samples of C.P. No. 1, 1936-37	February 1937.
278	Spinning Test Report No. 810 on samples of Khandesh, 1936-37	February 1937.
279	Technological Report on Late Verum (Nagpur), 1936-37	February 1937.
280	Technological Report on Punjab-American 289F, 1936-37	February 1937.
281	Spinning Test Report No. 812 on samples of Farm Westerns, 1936-37	March 1937.
282	Spinning Test Report No. 813 on samples of Broach, 1936-37	March 1937.
283	Spinning Test Report No. 819 on samples of Surat, 1936-37	April 1937.
284	Spinning Test Report No. 820 on samples of Jagadia, 1936-37	April 1937.
285	Spinning Test Report No. 821 on samples of Broach, 1936-37	April 1937.

Circular No.	Title.	Date of publication.
286	Spinning Test Report No. 825 on samples of Muttia, 1936-37	April 1937.
287	Spinning Test Report No. 826 on samples of Nanded, 1936-37	April 1937.
288	Spinning Test Report No. 827 on samples of Bailhongal, 1936-37	April 1937.
289	Spinning Test Report No. 828 on samples of Navsari, 1936-37	April 1937.
290	Spinning Test Report No. 829 on samples of Punjab-American, 1936-37	April 1937.
291	Spinning Test Report No. 830 on samples of Hubli-Kumpta, 1936-37	April 1937.
292	Spinning Test Report No. 834 on samples of Surat, 1936-37	May 1937.
293	Spinning Test Report No. 835 on samples of Kampala, 1936-37	May 1937.
294	Technological Report on Sind-Sudhar (289F-1), 1936-37	May 1937.
295	Spinning Test Report No. 837 on samples of Kadi-Viramgam, 1936-37	May 1937.
296	Spinning Test Report No. 838 on samples of Jinja, 1936-37	May 1937.
297	Spinning Test Report No. 840 on samples of African Busoga, 1936-37	May 1937.
298	Spinning Test Report No. 845 on samples of Jagadia, 1936-37	May 1937.
299	Technological Report on Surat 1027 A.L.F., 1936-37	May 1937.
300	Spinning Test Report No. 846 on samples of Kadi, 1936-37	May 1937.
301	Spinning Test Report No. 847 on samples of Bawla, 1936-37	May 1937.

Summaries of Technological Bulletins, Series A, Nos. 36 and 37 and Series B, No. 22, and the three papers are given below :—

(1) *Technological Bulletin, Series A, No.* 36, "*Spinning Tests on Mixtures of Staple Fibres and Indian Cottons.*"—This report contains the results of spinning tests carried out on staple fibres and their mixtures with cotton. The cottons selected were Cambodia Co. 2 and Jayawant and these were mixed in two different proportions with three types of staple fibres called here A, B, and C. These staple fibres were about 1.5 deniers per filament and their staple lengths were 1.20", 1.32" and 1.44" respectively. They were mixed with the cottons at the back of the first head of Draw Frame in the proportion of 1 : 2 and 2 : 1, were spun into 20's and 30's counts with 3½ and 4 twist multipliers. The yarns obtained were tested for lea strength, actual counts, ballistic work of rupture, single thread strength, percentage extension and number of turns per inch. They were also examined for their evenness and neppiness. The fibres of pure cotton

were examined for their fibre-length, fibre-weight, ribbon-width and convolutions per inch, while the staple fibres were examined for fibre-length, fibre-weight and ribbon-width. The following conclusions are drawn from the results obtained in these tests :—

(*i*) *Yarn Breakages.*—The three staple fibres gave practically no breakages in the ring frame which is one of the remarkable features in the spinning of these fibres. This freedom from breakages was even transferred to their mixtures which gave fewer breakages than the pure cottons. This was especially the case with staple fibre A.

(*ii*) *Yarn Evenness.*—The yarns obtained from the three staple fibres were much superior to those of the cotton yarns in respect of evenness. Furthermore, as one would expect the evenness of yarns improved as the proportion of the staple fibre in the mixture was increased.

(*iii*) *Yarn Neppiness.*—The staple fibre yarns are absolutely free from neps. They also possess an extremely smooth appearance. The effect of their complete freedom from neps is reflected in a considerable improvement in the appearance of the yarns when the proportion of the staple fibre in the mixture is increased. However, the neppiness of a mixture does not always follow a simple additive law and the suitability of two fibres to mix together or the mechanical action of the treatment may cause some modification in yarn-neppiness.

Other considerations permitting, admixture of a small percentage of suitable staple fibre may be found useful in reducing yarn breaks and improving the evenness and neppiness of yarns where results are called for by the peculiar characters of a cotton or mixing.

(*iv*) *Yarn Strength and Yarn Extension.*—(*a*) *Staple fibres.*—These results show that three features stand out clearly distinguishing the staple fibre yarns from the cotton yarns. The first is that in these yarns a comparatively low lea strength is associated with a very much higher ballistic test than is usually met with in cotton yarns. Secondly, the staple fibre yarns have a much higher extensibility than cotton yarns. The third is that the twist required for staple fibre yarns to attain the maximum strength is lower than that for cotton.

(*b*) *Effect of increasing the proportion of staple fibres in the mixtures.*—If the proportion of the staple fibre in the mixture is increased, the lea strength and the single thread strength of the yarns spun from the mixture decrease, while the ballistic work of rupture and the percentage extension increase, the decrease in the lea strength being generally greater in magnitude than the increase in the ballistic work of rupture. Furthermore, the magnitude of these changes in yarn-strength depends on the variety of the cotton and type of staple fibre employed in the mixture.

(c) *Mixtures of staple fibre and cotton.*—It was observed that the different cottons responded differently depending upon their ballistic work of rupture and mean fibre length. Thus, if the ballistic work of rupture of the yarns of a cotton is high in comparison to its lea strength and if this cotton is mixed with a staple fibre, the yarns obtained from the mixture may give a high ballistic test, even excelling those that are obtained by mixing the same staple fibre with another cotton which gives a much better lea strength and only a slightly higher ballistic strength. Furthermore, the strength results of the mixtures were found to be influenced by the disparity between the mean lengths of the cotton and the staple fibre, the smaller the disparity the better the results given by the mixture and *vice versa*. This held true irrespective of the fact that individually the staple fibre possessing the longest staple gave the best results.

(2) *Technological Bulletin, Series A, No.* 37, "*Further Tests on Indian Cottons with Different Systems of High Draft Spinning.*"—This report contains the results of spinning tests carried out with nine different systems of spinning on the three Indian cottons, viz., (1) Superfine Oomra, (2) Punjab-American 4F and (3) Cambodia Co. 2 and their mixtures in even proportions. The systems of spinning are designated by the symbols A, B, C, D, E, F, H, K, and L. Three of them, namely, B, E and H, are ordinary 3-roller systems or their modifications and the yarns were spun on them from single hank rovings with normal draft. The remaining six represent high draft systems using either four lines of rollers or special drafting units and the yarns were spun on them from double hank roving with double the normal draft. The following conclusions are drawn from a consideration of the results of these tests :—

(*i*) *Yarn Breakages.*—The 3-roller system with a lighter middle top roller and closer setting gave fewer breakages than the ordinary system. The three self-contained high draft units A, F and C reacted differently to pure cottons and the mixtures in so far as with the pure cottons, system A gave the lowest and system C the highest number of breakages, the position was reversed with the mixtures of these cottons. Of the 4-roller systems, L gave, on the whole, fewer yarn breakages than K which in its turn was found superior to D in this respect. The two 4-roller systems, K and L, gave a smaller average of breakages than any of the special high drafting units.

(*ii*) *Yarn neppiness.*—Yarn neppiness showed a tendency to increase with the count, but no evidence of any appreciable effect on neppiness of the different modes of drafting employed in these tests was observed.

(*iii*) *Yarn evenness.*—The 4-roller system K is better than the 4-roller system D and equal to the best of the three special drafting units A, C and F; system L is inferior to K, and in all cases the yarns spun from double roving with double draft are somewhat more even than those spun from single roving with normal draft.

(*iv*) *Yarn strength.*—The high draft unit C was found to be definitely inferior to the unit A and only slightly superior to the ordinary 3-roller system. The special high draft unit F and the 4-roller system D gave, on the whole, nearly equal results with this difference that the former (F) was found to be somewhat better suited to mixtures of cottons than the latter (D). Both gave definitely better results than the ordinary 3-roller system, their superiority being more pronounced in the higher than in the medium or coarse counts. As between A, D and F (leaving aside C as being definitely inferior to any of these), A led in the coarser counts spun from Oomra, but lost its lead in the medium and the finer counts spun from the other cottons and their mixtures. This agrees with the results of an earlier investigation where it was observed that while the superiority of A over a 4-roller system is unquestioned in the coarser counts, the latter system caught up with the former in the higher counts.

As in the case of the unit A, the unit L was found to be better suited to spinning of coarse or medium counts, while for the higher counts the plain 4-roller system K gave just as good strength results. Since in the spinning of coarse or medium counts a lower quality mixture or cotton is ordinarily used, it appears that both units, A and L, exercise more elastic control over the short fibres, thereby improving yarn strength, while with the better quality mixtures or cottons the plain 4-roller system is capable of exercising an equally good control.

For the benefit of practical men, a table showing the lea-strength in one count lying near to the highest standard warp count and a graph representing these values to show at a glance the different response of the cottons and their mixtures to the various systems of spinning are included in the Bulletin.

(3) *Technological Bulletin, Series B, No. 22, "The Effect of Twist on the Strength and Length of Cotton Fibre."*—Five Indian cottons capable of spinning from 6's to 34's warp yarn were chosen and in each case, the fibre strength and the percentage contraction were measured with zero twist and after inserting 25, 50 and 100 turns both in the right handed and left handed directions. For strength tests Barratt's apparatus, with certain modifications, was used, while the contraction was read on a micrometer in the eye-piece of a telescope. The mean humidity for each of these twists was kept nearly constant, to avoid applying large corrections on this account. The following conclusions are derived from a consideration of the results :—

(*i*) The frequency distributions of the strength values are best represented by Pearson's Type I curve, whether the tests are made on whole fibres or centimetre lengths. When the fibres are twisted the form of the curve is unaltered.

(*ii*) If all the results are combined it is found that the effect of left handed twist is slightly greater than that of right handed twist.

(*iii*) For Cambodia Co. 1, mean fibre-strength is unchanged upto 25 turns after which it increases by a small amount and then remains steady for higher twist. For the other cottons the fibre strength increases with twist from the outset ; reaches a maximum value and then falls as the twist is gradually increased. But the rate of change of strength and the point at which the maximum value is reached are different for the different cottons. The maximum increase in strength for these cottons lies between 3 and 9 per cent. of the value at zero twist.

(*iv*) Parabolic curves were fitted to the strength values and it was found that all cottons reach their maximum fibre strength only after some 40 turns per inch are inserted and that the longer cottons could withstand a higher degree of twist than the shorter ones, before reaching their maximum fibre strength, the peak value for Cambodia Co. 1 occurring at about 200 turns per inch.

(*v*) At 100 turns per cm. (254 turns per inch), there is a considerable fall in fibre strength, which is greater for the shorter than for the longer cottons. At this high twist, the shortest cotton, viz., A. 19, lost as much as 24 per cent. of its fibre strength, while the longest, Cambodia Co. 1, has practically lost nothing.

(*vi*) Direction of twisting has no effect on the variability of fibre strength. Variation in fibre strength is very nearly constant upto 50 turns per cm., but at 100 turns per cm. it is significantly higher for all cottons except Cambodia Co. 1.

Furthermore this increase in strength variability at 100 turns is greater for the shorter than for the medium cottons. Thus, at high twists the fibres of these cottons are not only rendered weaker but also more variable in strength and in both the cases, the effects are greater with the shorter cottons.

(*vii*) When twist is increased from zero to 25 turns or 50 turns per cm., the skewness of fibre strength distribution curve falls for some cottons and rises with others. The skewness at 100 turns, however, is significantly higher, being nearly twice as much the value for 50 turns for all cottons except Cambodia Co. 1.

(*viii*) Direction of twist does not make any difference to the mean value of percentage contraction upto 50 turns per cm. At 100 turns, however, there is a tendency for the fibres to contract more with the right handed than with the left handed twist.

(*ix*) Fibres of all cottons contract on being twisted, the percentage contraction increases rapidly after medium twist (25 turns) is inserted and is greater for the shorter than for the longer cottons.

(*x*) Variability in length increases appreciably only after 50 turns are inserted and the increase is greater for the shorter than for the relatively longer cottons.

(*xi*) The correlation co-efficient between the strength and the percentage contraction of fibre is practically zero. Hence it is inferred that in many cases the fibre does not break at its thinnest point, which may in fact be rendered stronger, upto a limit, by the insertion of twist, but at a point where mechanical or bacterial injury has taken place.

(*xii*) Variability in the properties of the cotton fibre with twists is discussed and it is shown that so long as the twist is within the limits usually employed in spinning yarn, it improves, on the whole, the properties of the individual fibres. However, this improvement in fibre-properties in general and in fibre-strength in particular can account for only a very small fraction of the increase in yarn strength observed for the same range of twist.

(*xiii*) The bearing of these results on the molecular chain theory of the structure of cotton fibre is discussed and it is found that this theory is capable of explaining, in a general way, the principal effects of twist on hair strength observed by us.

Various errors that could have crept in this investigation have been examined and their effect shown to be negligible in a comparative study of cottons.

(4) *Paper entitled "Effects of Rainfall on the Quality of Indian Cottons."*—It has been known for a long time that cotton is one of those crops which are susceptible to considerable variations in quality under different soil and climatic conditions. Since the very inception of the Technological Laboratory in 1924, tests on the spinning value and fibre properties have been carried out, year after year, on a number of standard Indian cottons, which are grown in different parts of India. The importance of these tests was early recognised by Turner (1927), and later stressed by one of us Nazir Ahmad (1931). In course of time these records will form an excellent material for the study of weather factors on the quality of cotton. In this respect the work of the Laboratory relating to tests, under known and reproducible conditions, on the same varieties grown from pure seed for which full agricultural details are available, is unique among the sister institutions of the world. For the present, data to the extent of 13 years only are available, and these have been examined with a view to finding out (*a*) the secular change in quality, (*b*) the influence of rainfall in causing the annual variation. Fisher's method of fitting polynomials has been employed for the analysis of the data. Fifth degree polynomials are fitted to the weekly totals of rainfall every year. These provided six constants, which specified the average and the distribution of rainfall throughout the season. The secular trend in the rainfall distribution values as well as in the quality data was eliminated by fitting polynominal of the second degree, and on the residuals thus obtained the multiple regression equation was worked out. On account of the small number of years for which the quality data are available, each cotton could not be treated separately, but certain cottons were grouped together in

accordance with the locality of growth and distribution of rainfall. The following four groups of cottons are discussed in this paper :—

(*a*) Verum 262, Nagpur and Akola, C.A. 9.

(*b*) Wagad 8 and Surat 1027 A.L.F.

(*c*) Jayawant and Nandyal 14.

(*d*) Hagari 1 and Gadag 1.

From the results curves have been drawn to show at any particular period of the year, the benefit or harm to cotton of an additional inch of rain over the average.

From the analysis of the results the following conclusions can be drawn :—

(*i*) Rainfall is an important weather-element controlling the quality of cotton. It accounts for about $\frac{1}{3}$ to $\frac{1}{2}$, the total annual variation (obtained after removing the effect of secular change) in quality.

(*ii*) Rain in the last stage of ripening, i.e., the 'picking period' is harmful.

(*iii*) In the maturation period, additional rain is beneficial. Rainfall during this period is associated with higher temperature, and it is probably the moist heat that is useful for the proper thickening of the fibres.

(*iv*) In the case of cottons, Verum 262, C.A. 9, Wagad 8 and Surat 1027 A.L.F., the growing period may be divided into two parts—in the first half, i.e., in July and August additional rain is beneficial, while in the second half, i.e., in September and October it is definitely harmful. On the other hand for cottons like Jayawant, Nandyal, Hagari 1 and Gadag 1 additional rain is harmful throughout the growing season. This is due to the fact that most of the rain falls prior to sowing and during the sowing period; consequently the soil is saturated with moisture due to the residual effects of previous rain. It is suggested that well designed field experiments should be carried out at Dharwar and Nandyal Agricultural Stations with a view to finding out the optimum conditions of sowing.

(*v*) The 'Rainfall curves' in figs. 12-15 provide a useful index to the application of water by irrigation in any year of partial failure of rain. In cottons which are partly rain-fed and partly irrigated, irrigation water should *not be* given in equal amounts and in equal intervals of time, but should be properly adjusted with the amount and distribution of rainfall.

(5) *Paper entitled "Influence of Twist on Yarn Strength."*—The object of the tests described in this report was to study the influence of twist on yarn strength and to find, if possible, the optimum twist constant for each cotton. The cottons selected covered a wide range of staple length, extending from the short staple Oomra to the long stapled Sind Sea Island. The long staple cottons were spun both into carded and combed yarns,

while the short staple cottons were also spun with the same number of turns per inch into different counts to estimate the slippage factor as distinct from the grippage factor. The following conclusions are drawn from the results of these tests :—

(*i*) *Yarn breakages.*—In the counts which are definitely beyond the spinning capacity of P.A. 4F, the use of hard twist does not appreciably reduce the number of yarn breaks. For the medium-long staple cottons, yarn breakages in the ring frame in 40's counts spun with $3\frac{1}{2}$ twist multiplier gave satisfactorily few breakages which did not decrease by using a higher twist multiplier. In the case of the long staple cottons the yarn breakages decreased upto a twist multiplier of $3\frac{3}{4}$ after which they were sensibly constant.

(*ii*) *Yarn evenness.*—The use of a high twist in the P.A. 4F yarns either failed to cause any improvement in evenness or had a deleterious effect. On the other hand, Superfine Oomra gave equally even yarns with the different twist multipliers in 8's, 10's and 12's counts. In the higher counts, the yarns became uneven and the insertion of twist even if it increased their strength, could not pull up their evenness class. With the medium-long staple cottons, the yarns spun with twist-multiplier 4 were found to be somewhat more even than those obtained with the two lower twist multipliers.

The two long staple cottons gave equally even yarns in each count irrespective of the twist multiplier employed within the range 3—4. This held both for the carded and the combed yarns.

(*iii*) *Lea strength.*—A twist-multiplier of $4\frac{1}{4}$ or $4\frac{1}{2}$ may be taken as optimum for P.A. 4F spun into 20's counts while in the higher counts such as 30's and 36's even the insertion of high twist does not give sufficient strength. For Superfine Oomra, a twist multiplier of $4\frac{1}{2}$ may be regarded as suitable for spinning it into 10's counts, while a twist multiplier of 5 is necessary for spinning it into 12's counts. The higher counts 14's and 16's are beyond its spinning capacity and high twist fails to impart sufficient strength.

It is noteworthy that the force required to pull apart the slipping fibres in a yarn is found to be directly proportional to the number of fibres in the cross section. The value of the binding force on a single fibre for P.A. 4F cotton was estimated to be 0.0372 oz. which is roughly 5 times the value of its clinging power. We should expect this difference owing to the fact that in a yarn the fibres are in a twisted bundle. The value of the binding force on a single fibre for Superfine Oomra was estimated as 0.1 oz. This is higher than that obtained for 4F, but one should expect it in view of the latter cotton being a longer and finer one.

For medium-long staple cottons a twist multiplier of 4 gave the best results in 40's counts, but the difference in strength between this and the lower twist multiplier of $3\frac{3}{4}$ was small and other factors such as the appearance and production of yarn, etc., should also be taken into consideration.

With the long staple cottons it was observed that the influence of twist, as an aid to increasing yarn strength, was more marked with a coarser than with a finer cotton. The peak values of yarn strength were obtained with $3\frac{3}{4}$ twist multiplier after which there was a small decrease in most cases. But the difference between these values and those obtained with $3\frac{1}{2}$ twist multiplier was so small that the latter multiplier may be used with equally good results and the further advantages of a higher production and softer yarns.

(6) *Paper entitled "The Deterioration of Broach Palej Cotton on Storage."*—The following conclusions are drawn in this paper :—

(*i*) Fungi are largely responsible for the deterioration of Broach Palej cotton.

(*ii*) Bombay conditions of moisture and heat are conducive to growths of fungi in the monsoons, and therefore, these environments are as much to blame as the infection of fungi for the deterioration of this cotton.

(*iii*) For the study of fungi growing on cotton, it is necessary that they should be studied extensively from the cotton itself first, before attempting to grow them in cultures.

(*iv*) The stained and matted parts of lint were discovered to be seats of heavier infection of micro-organisms than the clean lint. The middle of the bale also seemed to be a more favoured site than the top.

(*v*) In view of the well-known cellulose decomposing powers of some of the fungi detected and their abundance on this cotton, their role towards deterioration cannot be doubted.

(*vi*) Further experiments are necessary to study the decomposing powers of all the different fungi observed in this study.

(*vii*) The fungi and bacteria detected in this cotton after storage over water and on special culture media, are listed below. The identification of some of these forms could not be carried beyond the family groups :—

FUNGI.

1. *Aspergillus niger.*
2. *A. Sydowi.*
3. *A. Ruber.*
4. *Penicillium* sp.
5. *Mucor hygrophilus.*
6. *M. racemosus.*
7. *Nematospora* sp.
8. *Chaetomium* sp.
9. *Dematiaceæ*, Type 1.
10. *Dematiaceæ*, Type 2.
11. *Dematiaceæ*, Type 3.
12. *Moniliaceæ.*
13. *Phycomyceates.*
14. *Endomycetes.*
15. *Actinomyces* sp.
16. Unidentified *Perithecium.*
17. *Tuberculariceæ.*
18. *Phomaceæ.*

BACTERIA.

1. Oval bipolar bacilli forming white colonies.
2. Bacilli forming yellow colonies.
3. Bacilli forming brown colonies.

(*viii*) In the course of this work a new type of fungal attack on the fibre has been observed which forms the subject of a separate paper.

V. GENERAL.

Visitors.—During the period under review Sir John Russell, Kt., D.Sc., F.R.S., Director of the Rothamsted Experimental Station, Rothamsted, and Dr. N. C. Wright, Ph.D., Director of the Hannah Dairy Research Institute, Aryshire, who had been invited by the Government of India to review the work of the Imperial Council of Agricultural Research, paid a visit to the Laboratory on the 4th November 1936. Among others who visited the Laboratory during the period under review the following may be mentioned :—

1. A party of ten students from the Sydenham College of Commerce, Bombay.
2. A party of 30 students and 4 teachers from the Agricultural College, Poona.
3. A party of 22 students and 2 members of the staff of the Allahabad Christian College, Allahabad.
4. 27 students of the Baroda Agricultural School, Baroda.
5. Some of the delegates to the First Conference of Scientific Workers on Cotton in India.
6. A party of about 15 students from Government Institute of Dyeing and Calico Printing, Shahadra.
7. A party of 12 students and 1 teacher from Kalabhavan Technical Institute, Baroda.

The Technological Assistants working at the mofussil Laboratories attended the Laboratory in November and December 1936 for the refresher course and the Conference of Technological Assistants.

The Conference of the Technological Assistants and the senior members of the staff of the Laboratory took place on the 4th and 5th December 1936.

Arising out the suggestion made by the writer in his Report of work done during his leave and deputation period in October 1934, the First Conference of Scientific Research Workers on Cotton in India was held in

Bombay on the 4th, 5th and 6th March 1937, at the Office of the Secretary, Indian Central Cotton Committee. The senior members of the staff of this Laboratory attended this Conference and took part in its deliberations.

Staff.—Full details regarding the technical staff of the Laboratory during the period under review are given on page 37, while any leave and other arrangements made during the period under review are briefly mentioned below :—

Mr. R. P. Richardson, Spinning Master at the Laboratory from November 1924 to November 1936, proceeded on leave preparatory to retirement on the 13th November 1936. The post was filled by the appointment of Mr. V. V. Gupte, B.Sc. (Tech.).

Mr. D. L. Sen returned from study leave on the 15th September 1936.

Dr. Lavji Thoria, Temporary Chemist, proceeded on short leave prior to his transfer to the Industrial Research Bureau, New Delhi. He relinquished the charge at the Laboratory on the afternoon of the 28th October 1936.

A new post of Technological Assistant to work under the Cotton Research Botanist, Parbhani, Deccan, was created and Mr. K. G. Deo, a Junior Tester at the Laboratory, was appointed to this post. He left the Laboratory on the 28th May 1937 to take charge of the new post.

The post of Junior Tester vacated at the Laboratory by the transfer to Parbhani of Mr. K. G. Deo was filled up by the appointment of Mr. S. M. Nawaz who had already worked as a temporary Junior Tester at the Laboratory in 1936 and who joined his duty on 15th June 1937.

Mr. G. J. Kharkar, B.Sc., a Junior Tester, was selected as an Officer in the Coronation Contingent to represent his Unit at the Coronation of His Majesty the King-Emperor and was granted special leave from 9th April 1937 to 16th June 1937.

A post of Temporary Fitter for a period of three months was created in connection with the ginning experiments and Fitter Dahya Goshai was appointed to this post from 15th March 1937 to 14th June 1937.

As in the past, two students for training in the elements of cotton technology and fibre and yarn testing were selected in December 1936. These were Messrs. M. N. Vyas and F. V. Shah. Mr. Shah attended the Laboratory for a few days and then discontinued his training. The period of training of Mr. Vyas expires on the 1st July 1937.

Exhibitions.—The assistance given by the Laboratory both in the matter of preparing exhibits for the various exhibitions held in the country and deputing one or two Junior Testers for demonstration work has now

become a permanent feature of its activities. Each year the Laboratory is asked to supply material and men for two or three exhibitions. During the period under review the Laboratory participated in three exhibitions, namely, (1) the U. P. Industrial and Agricultural Exhibition held at Lucknow from 5th December 1936 to 24th February 1937, (2) the All-India Exhibition, held at Delhi from 27th February 1937 to 11th April 1937, and (3) the Third Indian Industries Fair, held in Bombay from 7th May 1937 to 24th May 1937. Exhibits prepared from 26 Indian cottons and a large number of testing apparatus were despatched to these exhibitions. Mr. K. G. Deo was put in charge of the Committee's stall both in Delhi and the Bombay Exhibitions and he also assisted the Publicity Officer in the Lucknow Exhibition. Mr. Deo's work was uniformly of a high order and it is gratifying to note that a silver medal certificate was awarded by the Lucknow Exhibition authorities for cotton testing demonstration. In view of the frequent calls that are likely to be made in future on the Laboratory for participation in the exhibitions it is proposed to have a duplicate set of exhibits and to train up one or two Junior Testers especially for the work.

ACKNOWLEDGMENTS.

I have great pleasure in expressing my gratefulness to the office-bearers of the Committee from whom I continued to receive valuable assistance and who throughout the period covered by this report took the keenest interest in the work of the Laboratory. I am also grateful to Mr. Varjivandas Motilal of Messrs. Narandas Rajaram & Co., Bombay, for his kindness in valuing the numerous cotton samples tested in the Laboratory in the course of the year and to the entire staff of the Laboratory for their loyal co-operation.

(Sd.) N. AHMAD,
Director,
Technological Laboratory.

Dated, 7th July 1937.

APPENDIX.

LIST OF SCIENTIFIC AND TECHNICAL STAFF OF THE TECHNOLOGICAL LABORATORY, AS ON 31st MAY 1937.

	Designation.	Name.	Remarks.
1.	Director	Dr. Nazir Ahmad, M.Sc., Ph.D., F. Ins. P. ..	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga.
2.	Senior Research Assistant (Chemist) ..	Mr. D. L. Sen, M.Sc., Tech. (Manch.), M.Sc. (Bom.), A.I.I.Sc., F.I.C.	Research Student at the Indian Institute of Science and Manchester College of Technology.
3.	Senior Research Assistant (Physicist) ..	Mr. N. Hari Rao, M.Sc. (Calcutta)	Research Scholar, Technological Laboratory (Textile Physics).
4.	Senior Research Assistant (Physicist) ..	Mr. Ram Saran Koshal, M.Sc. (Punjab) ..	Do. do.
5.	Spinning Master	Mr. V. V. Gupte, B.Sc. Tech. (Manchester) ..	——
6.	Junior Research Assistant (Microscopist)	Mr. Amar Nath Gulati, M.Sc., (Punjab) ..	Imperial Institute of Veterinary Research, Mukteswar, U. P.
7.	Statistician and Personal Assistant ..	Mr. V. Venkataraman, M.A. (Madras) ..	Statistical Assistant, Labour Office, Government of Bombay.
8.	Junior Research Assistant	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory (Textile Physics).
9.	Do. do.	Dr. K. R. Sen, D.Sc. (Dacca)	Research Scholar, Technological Laboratory and Technological Assistant, Lyallpur.
10.	Electrician	Mr. Herculano Lobo, L.E.E. (V.J.T.I.) ..	——
11.	Spinning Assistant	Mr. N. Iyengar	——
12.	Senior Tester	Mr. H. B. Joshi, B.Sc.	——

LIST OF SCIENTIFIC AND TECHNICAL STAFF OF THE TECHNOLOGICAL LABORATORY, AS ON 31ST MAY 1937—*contd.*

	Designation.	Name.	Remarks.
13.	Senior Tester	Mr. S. S. Sukthankar, L.T.C. (V.J.T.I.)	——
14.	Junior Tester	Mr. R. G. Panvalkar, B.Sc.	——
15.	Junior Tester	Mr. G. D. Bhide, B.Sc...	——
16.	Junior Tester	Mr. K. V. N. Nayar	——
17.	Junior Tester	Mr. V. N. Modak, B.Sc.	——
18.	Junior Tester	Mr. L. V. Sundararaman, B.A.	——
19.	Junior Tester	Mr. P. S. Sambamurthy	——
20.	Junior Tester	Mr. G. J. Kharkar, B.Sc.	——
21.	Junior Tester	Mr. Sassoon Samson, B.Sc.	——
22.	Junior Tester	Mr. A. J. Farid	——
23.	Junior Tester	Mr. U. K. Benegal, B.A.	——
24.	Junior Tester	Mr. P. V. Nachane, B.Sc.	——
25.	Junior Tester	Mr. C. S. Ramanathan, B.Sc.	——
26.	Junior Tester	Mr. A. N. Rao, M.Sc.	——
27.	Junior Tester	Mr. B. N. Prabhakar, B.Sc.	——
28.	Draughtsman	Mr. B. G. Mehta	——
29.	Statistical Clerk	Mr. R. Krishna Iyer	——
30.	Statistical Clerk	Mr. P. K. Wagle	——
31.	Mechanic	Mr. J. B. Kharas	——

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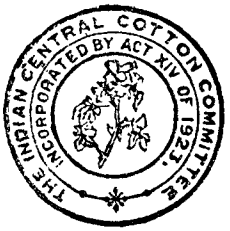

Indian Central Cotton Committee.

With the Secretary's Compliments.

Vulcan House, Nicol Road,
Ballard Estate,
Fort, Bombay.

INDIAN CENTRAL COTTON COMMITTEE

ANNUAL REPORT

OF THE

DIRECTOR

TECHNOLOGICAL LABORATORY

FOR THE

YEAR ENDING 31st MAY 1938

Annual Report of the Director, Technological Laboratory, for the Year Ending 31st May 1938

COMMENCING with last year it has been decided to present the Annual Report of the Laboratory at the monsoon meeting of the Indian Central Cotton Committee. This is the second Annual Report under the new arrangement and it covers the period from 1st June 1937 to 31st May 1938. The work done at the Laboratory during this period will, as usual, be described under the following heads :—

I. Spinning Laboratory.

II. Research Laboratory.

III. Moisture Testing Section.

IV. Publications.

V. General.

I. SPINNING LABORATORY.

In the following Statement A will be found a summary of the agricultural, trade and standard cotton samples spun and tested in the Laboratory during the period under review, together with the names of the officers or the organisations who supplied the samples :—

STATEMENT A.

BOMBAY.

(1) *The Cotton Breeder, Khandesh, Jalgaon.*—22 samples of Jarilla, Banilla, N. R. and local cottons.

(2) *The Cotton Breeder, S. M. C., Dharwar.*—9 samples of Jayawant and cross strains.

(3) *The Cotton Overseer, Athni.*—Two samples of Jayawant and Kumpta cottons.

(4) *The Cotton Breeder, Surat.*—2 samples of segregates.

(5) *The Cotton Breeder, Viramgam.*—3 samples of strains.

(6) *The Cotton Breeder, Broach.*—6 samples of B. D. 8 and other selections.

PUNJAB.

(1) *The Cotton Research Botanist, Lyallpur.*—45 samples of 4F, 289F, Mollisoni, 289F/43, L.S.S., D.C. and other Lyallpur cottons.

UNITED PROVINCES.

(1) *The Economic Botanist to Government, U.P., Cawnpore.*—2 samples of C. 402 and C. 520 cottons.

MADRAS.

(1) *The Cotton Specialist, Coimbatore.*—2 samples of strains.

(2) *The Business Manager, T.C.T.S., Tirupur.*—3 samples of Cambodia cotton.

(3) *The Superintendent, Agricultural Research Station, Koilpatti.*—10 samples of K. 1 and other strains.

(4) *The Superintendent, Dry Farming Station, Bellary.*—8 samples of Co. 2 and H. 1 cottons.

(5) *The Farm Manager, Agricultural Research Station, Guntur.*—8 samples of different strains.

CENTRAL PROVINCES.

(1) *The Economic Botanist for Cotton, C.P., Nagpur.*—9 samples of Buri crosses and other strains.

MISCELLANEOUS.

(1) *The Director, Institute of Plant Industry, Indore.*—38 samples of Malvi 9, Dhar and other cottons.

(2) *The Cotton Research Botanist, Parbhani, Deccan.*—22 samples of Gaorani, Parbhani and local cottons.

(3) *The Inspector, Cottonseed Distribution, Kopbal.*—2 samples of Jayawant cotton.

(4) *The Superintendent, Government Main Farm, Raichur.*—8 samples of Kumpta, Jayawant and other cottons.

(5) *The Assistant Cotton Breeder, Agricultural Expt. Station, Amreli.*—5 samples of N. R., Jarilla, mixtures and other cottons.

(6) *The Superintendent, Cotton Farm, Vesma.*—2 samples of 1027 A.L.F. cotton.

(7) *The Prime Minister, Rampur State, Rampur.*—2 samples of C. 520 and Local cotton.

(8) *The Inspector, Co-operative Weaving Society, Sylhet, Assam.*—One sample of Assam Hill cotton.

(9) *The Second Economic Botanist, Dacca.*—1 sample of Co. 2 (Dacca) cotton.

(10) *The Secretary, Indian Central Cotton Committee, Bombay.*—One sample of Mekran cotton.

(11) *The Director of Agriculture, N.W.F.P., Peshawar.*—One sample of Rustan Marwat cotton.

(12) *The Deputy Director of Agriculture, Myingyan Circle, Meiktila, Burma.*—6 samples of Mahlaing and Wagale and other strains.

(13) *The Senior Botanist, Dept. of Agriculture, Uganda,*—8 samples of Uganda selections.

The details of standard cottons are given on page 9.

Details of samples supplied by the East India Cotton Association, Ltd., Bombay, and the Millowners' Associations of Bombay and Ahmedabad, will be found on page 11.

The samples received for tests of different types have been classified below in Table I, which also gives, for purposes of comparison, the corresponding figures for the last year :—

TABLE I.—*Samples Received for Tests.*

	1-6-36 to 31-5-37	1-6-37 to 31-5-38
Agricultural Departments	213	281
Standard Cottons	19	22
Trade Tests	65	62
Fibre Tests	136	84
Yarn Tests	58	53
Special Tests	30	42
Total ..	521	544

It will be noticed that the total number of samples received for tests at the Laboratory shows an increase over last year. This increase is most marked in the case of samples received from the Agricultural Departments, while the number of samples received for fibre tests shows a decrease.

The following Tables II, III and IV give the distribution of samples, lots and counts spun and tested at the Laboratory during the period

under review together with the corresponding figures for the previous years :—

TABLE II.—*Distribution of Samples Spun*, 1924-38.

Province.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.
Bombay ..	18	26	22	22	28	66	89	69	143	111	97	59	67	44
Sind ..	..	..	..	..	..	..	..	..	..	..	..	28	47	..
Punjab ..	14	1	..	..	42	30	10	44	55	42	23	71	9	45
U. P. ..	7	..	6	11	9	7	16	7	12	6	7	11	..	2
Madras ..	2	19	50	23	30	51	66	15	28	101	30	51	31	31
C. P. ..	2	..	3	2	2	5	3	3	5	9	9	10	15	9
Miscellaneous.	3	11	..	6	6	27	28	33	75	97	85	100	85	97
Total ..	46	57	81	64	117	186	212	171	318	366	251	330	254	228
Standard Cotton Tests .	8	54	49	64	33	34	27	18	18	16	18	23	15	21
Trade Tests and Special Tests ..	..	..	..	..	..	37	89	134	125	166	131	143	162	185
Grand Total..	54	111	130	128	150	257	328	323	461	548	400	496	431	434

TABLE III.—*Distribution of Lots Spun*, 1924-38.

Province.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.
Bombay ..	36	52	44	44	53	107	90	69	143	111	97	61	69	44
Sind ..	..	..	..	..	..	..	..	..	..	..	..	28	47	..
Punjab ..	26	4	..	..	83	41	10	44	55	42	23	71	9	45
U. P. ..	14	..	12	22	18	14	16	7	12	6	7	11	..	2
Madras ..	4	38	100	46	60	85	66	16	28	101	30	51	31	31
C. P. ..	3	..	6	4	4	10	4	3	5	9	9	10	15	9
Miscellaneous	3	22	..	12	9	33	29	33	75	97	85	100	85	99
Total ..	86	116	162	128	227	290	215	172	318	366	251	332	256	230
Standard Cotton Tests ..	34	176	142	178	68	64	54	36	36	32	36	46	30	42
Trade Tests and Special Tests ..	..	..	..	..	..	37	119	186	129	175	175	175	182	205
Grand Total.	120	292	304	306	295	391	388	394	483	573	462	553	468	477

TABLE IV.—*Distribution of Yarns Spun*, 1924-38.

Province.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.
Bombay ..	103	152	132	132	159	322	253	203	430	332	292	190	217	134
Sind ..	..	..	..	..	..	..	..	..	..	..	..	84	143	..
Punjab ..	106	14	..	..	254	113	31	136	165	127	72	220	28	144
U. P. ..	27	..	36	66	54	42	40	22	32	18	21	35	..	6
Madras ..	12	108	278	138	180	255	199	53	85	303	90	151	89	91
C. P. ..	8	..	18	12	12	30	12	9	15	27	29	30	45	28
Miscellaneous.	3	58	..	36	27	99	100	93	227	293	250	295	261	292
Total. ..	259	332	464	384	686	861	635	516	954	1100	754	1005	783	695
Standard Cotton Tests ..	95	514	423	447	290	223	309	136	200	180	204	162	115	156
Trade Tests and Special Tests ..	..	..	..	..	..	80	343	502	256	499	810	609	649	665
Grand Total .	354	846	887	831	976	1164	1287	1154	1410	1779	1768	1776	1547	1516

It will be noticed that, as compared with last year, the number of samples and lots tested at the Laboratory shows a small increase, while the number of counts into which these samples and lots were spun shows a very slight decrease.

In addition to samples received for spinning or fibre tests, the Laboratory also receives samples of yarns from various mills, and carries out tests on them on payment of fees laid down by the Indian Central Cotton Committee. During the period under review 53 samples of yarns were received for tests of different types. This number is practically the same as tested last year.

The results of tests carried out at the Laboratory on samples of cotton and yarn form the subject of fibre test, spinning test or yarn test reports, which are furnished to the suppliers of the samples. From among these reports, those relating to samples of trade varieties of fair average quality supplied by the East India Cotton Association and samples of early arrivals supplied through the Millowners' Association of Bombay and Ahmedabad, are published in the form of 2-3 page technological circulars, which are freely distributed among the trade. Copies of these circulars are also sent to consumers of Indian cottons in foreign countries so as to place in their hands authentic information regarding the waste losses and spinning performance of these cottons. These technological circulars are later compiled in the form of a Technological Bulletin, Series A, and serve as a ready handbook for those interested in Indian cottons. Apart from these, such reports as deal with the agricultural samples are sent only to the agricultural officers supplying these samples, while reports on samples furnished by the mills and tested for them on payment of fees are supplied only to the mills concerned. The following Table V gives a summary of the reports of different types issued from the Laboratory in each year since 1924 :—

TABLE V.—*Test Reports Issued,* 1924-38.

Reports	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.
Spinning Test.	7	19	19	22	21	63	92	60	87	121	112	135	129	109
Fibre Test ..	1	1	5	1	7	4	7	19	30	18	19	44	52	32
Yarn Test ..	..	..	..	1	4	4	2	3	5	3	7	13	10	14
Total Reports.	8	20	24	24	32	71	101	82	122	142	138	192	191	155

It will be noticed that the total number of reports issued from the Laboratory during the year under review is somewhat less than that of last year. This decrease is partly due to comparatively fewer fibre test reports being issued owing to the receipt of smaller number of samples for fibre tests and partly to the fact that during a greater part of the year more emphasis was laid upon certain technological problems which involved the spinning and testing of special samples. The results of these tests are not

embodied in fibre or spinning test reports, but are published in the form of technological bulletins. Inspite of this decrease, the number of reports issued in 1937-38 is more than 50 per cent. higher than that for 1930-31 and nearly 8 times that for 1925-26.

During the period under review the permanent staff of the Laboratory remained the same as in the previous year. The following table gives the strength of the staff of the Laboratory from year to year since 1924 :—

TABLE VI.—*Permanent Staff*, 1924-38.

——	1924.	1925.	1926.	1927.	1928.	1929.	1930.	1931.	1932.	1933.	1934.	1935.	1936	1937	1938
Technical Staff ..	8	11	20	24	27	27	32	32	32	33	34	34	34	35	35
Research Students .	1	3	6	4	3	2	1	1	..	..	..	..	2	2	2
Fumigation Chemists .	..	..	2	4	2	2	2	2	2	2	2	2	2	2	2
Total ..	9	14	28	32	32	31	35	35	34	35	36	36	38	39	39

The tests carried out on many of the samples included in Statement A were of a routine nature, but there were certain samples among them which deserve special mention. These are as follows :—

(*a*) AGRICULTURAL SAMPLES.

(1) *Uganda Cottons.*—The Indian Central Cotton Committee has decided that a maximum of 8 samples of improved varieties, which are being tried in the Uganda Protectorate, may be tested free of charge at the Laboratory. In accordance with this decision tests were made on 8 samples supplied during the current year by the Department of Agriculture, Uganda, and a Spinning Test Report on these samples was supplied to the Officer concerned.

(2) *Burma Cottons.*—As in the case of the Uganda Protectorate the Committee has also decided that a maximum of 8 samples, to be supplied by the Department of Agriculture, Burma, may be tested free of charge at the Laboratory. In accordance with this decision 6 samples were received from the Deputy Director of Agriculture, Myingyan Circle, Meiktila, Burma, and tests on them are in progress.

(3) *Long Staple Sind Cottons.*—As is well known, India has a surplus of short and medium staple cottons, while she has a deficiency of long staple cottons. As a result of this state of affairs, she is compelled, on the one hand, to find a market for her surplus of short staple cottons and, on the other, to import a certain quantity of long staple cottons for the manufacture of finer qualities of cloth. The attempts, therefore, to grow in India such long staple

varieties, which would be suitable for spinning into fine counts and which could be available at competitive prices, deserve to be followed with keen interest. With this object in view detailed tests were made on Sind Sea Island, Boss III-16 and Ashmouni cottons grown in Sind and their performance was compared with Egyptian cottons sold in the market. The Technological Research Sub-Committee considered these results at its meeting held on the 14th August 1936 and decided that, in order to take due account of seasonal variation, these tests should be repeated. This work has now been completed, and tests have been made on samples of Sind Sea Island, Boss III-16 and Ashmouni supplied direct by the Agricultural Department and also obtained from the mills consuming these cottons as well as samples of Egyptian Giza and Maarad purchased from the market. A detailed report, embodying the results of all these tests, has been prepared and is placed on the agenda of the Sub-Committee as a separate item.

Another Sind cotton, which has recently come to the fore, is 289F-1, which is now commercially known as *Sind Sudhar*. In view of the importance of this cotton, tests were made on 9 samples with the object of studying the effect, on the yield and quality, of growing it after different kharif and rabi crops. It was found that two out of the 9 treatments gave definitely poor results in almost all respects, while among the remaining 7 treatments, one treatment scored on point of yield and the other on point of spinning performance. These results were communicated to the Agricultural Department, Sind.

(4) *Khandesh Cottons.*—In Khandesh a new cotton Jarilla has lately given very promising results. During the period under review samples of this cotton together with those of other varieties, viz., N.V. 56-17, N.R. 6 and Banilla, each grown in three different places in Khandesh, were subjected to tests at the Laboratory. The results of these tests on the 12 samples were treated by analysis of variance, which showed that (1) in each case the cottons grown in the Jalgaon Farm gave significantly higher mean fibre-length and significantly stronger yarns than those grown either in Bhadgaon or Dhulia Farm between which there is nothing much to choose in respect of either property and (2) the fibre-weight per inch does not show significant variation from place to place for any of the four cottons. Experiments of this type are capable of yielding valuable information and should be carried out on other cottons.

It may be mentioned here that in addition to these tests, 6 samples of *Jarilla* and 2 samples of Local cottons, grown in the districts, were also tested in the Laboratory. It was found that the spinning performance of *Jarilla* cotton varied from 31 to 36's standard warp counts, that the Salsingi sample of Jarilla gave the best and the Amalner sample the poorest results, but that, in each case the Jarilla cotton gave very much better performance than Banilla cotton.

(5) In the Punjab, a new cotton, known as *Jubilee*, is rapidly coming under general cultivation. As it is extremely likely that in the future this

cotton would be mixed, in different proportions, with 4F cotton in place of Mollisoni, it was regarded advisable to carry out tests on mixtures of this cotton with 4F cotton with a view to estimating the performance of the mixtures. Accordingly, 11 samples of mixtures and pure cottons supplied by the Cotton Research Botanist, Lyallpur, were subjected to spinning tests. The results showed that decrease in the spinning performance of a mixture of these two cottons with increasing proportion of Jubilee is not progressive but takes place in discontinuous jumps. The best results, compatible with the difference in the prices of the two cottons, were obtained with comparatively low percentages of Jubilee cotton in the mixture. In the report issued on these samples it was suggested that these tests should be repeated in the next year.

(6) *Effect of differential irrigation on the quality of cotton.*—The experimental work on this problem is for the most part over and the Committee sometime back decided that papers embodying the results of this investigation should be published in the *Indian Journal of Agricultural Science.* During the period under review contributions to the papers were received from Coimbatore and Sakrand. The paper on the Coimbatore samples was written up and sent for publication in the Indian Journal of Agricultural Science, while the paper on the Sakrand samples is under preparation.

Furthermore, 8 samples belonging to 289F/43, which is now being pushed in the Punjab, were received, tested and reported upon during the period under review.

(7) *Extension of cotton cultivation.*—In my previous reports I have drawn attention to the several new areas in which the cultivation of cotton is either being tried or extended in different parts of India. During the period under review a sample of Kandhar cotton, grown in Baluchistan, was tested for the first time. It was found to possess a staple length of about $\frac{7}{8}$", and judging from its fibre properties should be suitable for spinning up to 22's standard warp counts. Similarly, a sample of Cambodia Co. 2, grown in Junagadh, was received for the first time and tested. It was found to have practically the same fibre characters (mean length, fibre-weight and fibre maturity) as the standard Co. 2 sample grown this year in Coimbatore.

A sample of 289F cotton was received last year from Bengal, where attempts are being made in earnest to grow long staple cottons for the consumption of the growing mill industry in that province. In the current year a sample of Co. 2 grown from Cambodia seed was received from Bengal. On being tested, it was found to be as good as the standard Co. 2 cotton of Coimbatore in respect of mean length and fibre-weight per inch.

Two samples of C520 and Desi Local Mundya were received for the first time from Rampur State. Both cottons were found to be suitable for spinning upto 7's standard warp count, the *Desi* cotton giving slightly stronger yarns.

Attempts are also being made to improve the quality of Assam cottons. A sample of cotton, which was grown in red gritty soil mixed with sand on the tops and slopes of the North Cachar Hill, was received for tests. It was found to have a staple length of 0.66″ but was suitable for spinning only upto 4's standard warp count. This cotton has the characteristic feature of possessing a very high fibre-weight per inch, and should, therefore, be suitable for purposes of mixing with wool.

Since last year new long staple varieties are also being tried in the N.W.F.P. During the current year a small sample of an interesting cotton, namely, Rustan Marwat, was received from Peshawar. It was found to possess a staple length of over 1⅛″, and the Grader spoke very highly of it. In the report on this sample was suggested that a large sample of it on which a spinning test can be made should be supplied to the Laboratory in the ensuing year.

(8) *Mekran Cotton*—It is reported that a certain amount of Persian cotton is being imported in India through Verawal and other Kathiawar ports. In view of this fact, the President, Indian Central Cotton Committee, suggested that tests might be made on Mekran cotton, and that its performance might be compared with the Kathiawar cottons. Accordingly, a sample of Mekran cotton was obtained direct from Persia and tested at the Laboratory. It was found to possess a staple length of 0.77″. It gave very high losses both in the blow-room and the card-room and proved more wasty than most of the Kathiawar cottons. However, with a few exceptions, its performance was better than that of the Kathiawar cottons.

(*b*) STANDARD COTTONS.

The annual Bulletin containing the results of the detailed tests carried out on Standard Indian cottons of the 1936-37 season, together with the results for the earlier seasons, was issued in August 1937.

The following statement gives the names of the standard cottons of the 1937-38 season on which tests have either been completed or are under progress in the Laboratory:—

BOMBAY.

1. Jayawant.
2. Gadag 1 (Dharwar-American).
3. Surat 1027 A.L.F.
4. Wagad 8 (Dholleras).

SIND.

5. Sind Sudhar (289F-1).
6. Sind N. R. (W. N. 27).

PUNJAB.

7. Punjab-American 4F.
8. Punjab-American 289F.
9. Mollisoni.

UNITED PROVINCES.

10. Aligarh A. 19 (Bengals).
11. C. 402 (U. P.)

CENTRAL PROVINCES.

12. (a) Verum 262 (Nagpur).
    (b) Verum 262 (Akola).
13. V. 434 (Akola).
14. Late Verum (Nagpur).

HYDERABAD.

15. Umri Bani.

MADRAS.

16. Cambodia Co. 2 (Cambodia 440).
17. Nandyal 14 (Northerns).
18. Hagari 1 (Westerns).
19. Karunganni C 7.
20. Koilpatti I (K. I.)

From among these cottons, 4-page Technological Circulars have as usual been issued on the following cottons, which were received sufficiently early in the season :—

1. Verum 262 (Nagpur).
2. Late Verum (Nagpur).
3. V. 434 (Akola).
4. Verum 262 (Akola).
5. P. A. 289F.
6. P. A. 4F.
7. Sind Sudhar.
8. Umri Bani.

Tests on the remaining standard cottons are in progress and the results will be embodied, in due course, in the Technological Reports on Standard Indian Cottons, 1938.

It may be mentioned in this connection that hitherto samples of P. A. 289 F and Mollisoni were supplied by the B. C. G. A. (Punjab) Ltd., Khanewal. The First Conference of Scientific Research Workers on Cotton in India held in Bombay on 4th, 5th and 6th March 1937 recommended that as in the case of the other standard cottons, samples of these two cottons should also be obtained from the Cotton Research Botanist. Accordingly, the Cotton Research Botanist, Lyallpur, was requested to supply in future samples of P. A. 289F and Mollisoni cottons.

Furthermore, as Koilpatti No. 1 (K. 1) is rapidly replacing Karunganni C. 7, the former cotton has now been included in the list of the standard Indian cottons, while tests on the latter will only be made for research purposes.

(c) Trade Samples and Samples from Cotton Mills.

The samples received in the Laboratory under this head fall into three classes. Firstly, there are the samples supplied by the East India Cotton Association Ltd., Bombay, in accordance with an arrangement entered into between the Association and the Indian Central Cotton Committee. These are the samples of fair average quality of the chief trade varieties of Indian cottons, the selection for this purpose being made by the Standards Committee of the East India Cotton Association, who also very kindly furnish their valuation reports on the samples. These are subjected to spinning tests; and the results of these tests are broadcast to the trade in the form of 2-3 page technological circulars, which also include the results for the previous years, wherever available. The second type of samples are those supplied through the Millowners' Associations of Bombay and Ahmedabad in accordance with a similar arrangement entered into between these Associations and the Indian Central Cotton Committee. These samples represent the early arrivals of the chief varieties of Indian cotton in the Bombay and Ahmedabad markets. Like the East India Cotton Association samples, these are also subjected to spinning tests and the results obtained constitute the material for 2-3 page technological circulars, which are similarly distributed to the trade and industry in this country and abroad. At the end of each season, all the technological circulars relating to the samples falling in these two classes are compiled together in the form of a Technological Bulletin. During the period under review spinning tests were made on the following trade cottons while a list of the technological circulars issued on them is given under the head "Publications."

1. *List of samples supplied by the East India Cotton Association Ltd., Bombay.*

1.	Dholleras	(1936-37).	14.	Karunganni	(1936-37).
2.	Broach (Palej)	(,,).	15.	A. R. Jinja	(,,).
3.	Jagadia	(,,).	16.	A. R. Busoga	(,,).
4.	Berar	(,,).	17.	A. R. Kampala	(,,).
5.	Khandesh	(,,).	18.	Westerns (Javaria)	(,,).
6.	Farm Westerns	(,,).	19.	Kumpta	(,,).
7.	Upland	(,,).	20.	Berar	(1937-38).
8.	Kadi-Viramgam	(,,).	21.	C. P. No. 1.	(,,).
9.	Bijapur	(,,).	22.	Khandesh	(,,).
10.	Kalagin	(,,).	23.	Broach	(,,).
11.	Bagalkote	(,,).	24.	Punjab-American	(,,).
12.	Cambodia	(,,).	25.	Latur	(,,).
13.	Tinnevelly	(,,).			

2. *List of samples supplied by the Bombay Millowners' Association, Bombay.*

1.	African Busoga	(1936-37& 1937-38).	10.	Ujjain (Mandsaur)	(1937-38).
			11.	Moglai	(,,).
2.	African Jinja	(,,).	12.	Farm Westerns	(,,).
3.	African Kampala	(,,).	13.	Broach (Palej)	(,,).
4.	Miraj (Shedbal)	(,,).	14.	Bailhongal	(,,).
5.	Tirupur Cambodia	(,,).	15.	Hubli Kumpta	(,,).
6.	Karunganni	(,,).	16.	Surat	(,,).
7.	Bengals (Hansi)	(1937-38).	17.	Kampala	(,,).
8.	Khandesh (Saudha)	(,,).	18.	Jinja	(,,).
			19.	Busoga	(,,).
9.	Ujjain (Ujjain)	(,,).	20.	Northern Cambodia	(1936-37).

The third type of samples received from the trade are those which are sent by the cotton mills or firms who take advantage of the testing facilities offered by the Laboratory. These tests are carried out on payment of certain fees, which have been laid down by the Indian Central Cotton Committee. Under this head 12 samples were received during the period under review for spinning tests, 26 for fibre tests, 37 for yarn tests, 20 for moisture tests and 23 for different types of cloth tests, the total number of samples being 118. The corresponding figure for last year was 96, and therefore the number of samples under this head shows a satisfactory increase of nearly 24 per cent. The steady increase observed in this side of the Laboratory's activity is sufficient proof of the growing recognition of its importance and usefulness to the trade and the industry. It is also a good augury for the success of the proposed Testing House, which is to form a part of the Laboratory's activities in the future. It might be mentioned in this connection that most of the machines required in connection with this Testing House, for which the necessary funds were sanctioned in August 1937, have now been purchased and erected in the Laboratory. These machines, however, have temporarily been placed in the Yarn Testing Section, but this arrangement is not very satisfactory. It has resulted in a certain amount of overcrowding, and it will certainly stand in the way of a unified and efficient control of the Testing House which is necessary for its development. For this purpose it is highly desirable to have these machines and testing apparatus in separate rooms and plans with this end in view will be submitted in due course.

In connection with the tests on trade samples, special mention may be made of seven samples of cloth, which were received from the Collector of Salt Revenue, Bombay, for finding out whether the cottons used in the manufacture of these fabrics were indigenous or foreign types. The necessary tests for the identification of fibres extracted from the warp and weft yarns of these fabrics were made and a detailed report giving the required information was issued to the Collector of Salt Revenue, Bombay.

Similarly, a sample of cloth was received from a firm in order to find out whether it was made from a pure material or a mixture and in the latter case the nature and proportion of the component fibres. The necessary

tests were made and a report embodying the required information was furnished to the firm concerned.

Another highly interesting experiment carried out for a local mill was on a sample of cloth, which had been damaged by mildew and which had apparently become valueless. On a closer examination, however, it was found that the fungi responsible for the mildew had not yet penetrated inside the fibres and that by means of a certain chemical treatment the bad effects of the mildew attack could be removed and the appearance of the cloth could be greatly improved. The results of these tests were reported to the mill concerned. In view of the fact that they were deemed to be of general usefulness, the mill was asked if they had any objection to the publication of these results. The mill very kindly replied that they had no objection, and a short article describing these tests and the method of recovering the damaged cloth was published in the *Indian Textile Journal*, a summary of which will be found under the head "Publications."

Several samples of yarns were received from a local firm, who wanted to find out the relative efficacy of different washing treatments on their strength and lustre. The necessary tests were carried out and a report was issued to the firm concerned.

In addition to these tests on trade samples, another side of the Laboratory's activity connected with the industry which is growing in volume is the supply of information regarding Indian cottons or details of processing them. For example, an enquiry was received from a firm in England as regards the Indian cottons which might be suitable for manufacture of motor-car tyres. A suitable reply, together with small samples of good-quality Indian cottons, was sent to this firm. Similarly, enquiries have been received from mills or firms in India regarding the relative advantages of vacuum stripping against hand and band stripping, spraying of cottons by oil emulsions, etc. One firm interested in the manufacture of hosiery yarns, has sent two samples of its cotton for studying the effect of twist on the strength, appearance, etc. of the yarns with a view to finding out the optimum working conditions. This side of the Laboratory's activity is capable of further development.

Mention has been made above of the fees which are charged by the Laboratory for the tests carried out on behalf of cotton firms and mills. These fees are given below for the information of those who wish to avail themselves of the facilities offered by the Laboratory :—

SCALE OF FEES.

		Rs.	a.
(1)	*Fibre or Yarn Test* :		
	(*a*) Mean fibre-length	5	0
	(*b*) Fibre-weight per inch	5	0
	(*c*) Fibre-strength	7	8
	(*d*) Lea test	5	0
	(*e*) Ballistic test	5	0
	(*f*) Single thread test	5	0
	(*g*) Twist	5	0
	(*h*) Fibre-width determination	5	0

		Rs.	a.
(2)	*Fibre and Blow-room Test*:		
	(*a*) Fibre tests as for (*a*)-(c) above		
	(*b*) Blow-room only	10	0
	(*c*) Ginning tests on *kapas*.	10	0
(3)	*Full Test*:		
	(*a*) Fibre tests as for (*a*)-(c) above		
	(*b*) Spinning test on cotton	35	0
	(*c*) Spinning test on sliver after combing it.	25	0
	(*d*) Spinning test on combed cotton	45	0
	(*e*) Tests in addition to the ordinary 3-roller system (*per system*)	5	0
(4)	*Variety of Cotton (broad classification)*	25	0
(5)	*Identification of Fibre (microscopic test)*	15	0
(6)	*Percentage of Size*	5	0
(7)	*Do. Grease*	5	0
(8)	*Do. Free Acid*	10	0
(9)	*Presence of Mildew in Cloth*	5	0
(10)	*Causes of Mildew growth*	30	0
(11)	*Percentage of immature fibres*		
	(*a*) In lint or *kapas*	7	8
	(*b*) In yarn or cloth	10	0
(12)	*Wax content*:		
	(*a*) 1st Sample	7	8
	(*b*) Each additional sample provided it is sent at the same time	5	0
(13)	*Determination of mechanical injury to fibre*	10	0
(14)	*Cloth samples.*		
	(*a*) Actual counts	5	0
	(*b*) Actual twist	10	0
	(*c*) Single thread strength	10	0
(15)	*Moisture Tests.*		
	(*a*) 1st sample	5	0
	(*b*) Each additional sample provided it is sent at the same time	2	8
(16)	*Shirley Analyser Tests.*	5	0
(17)	*Tests for analysis of Union Fabric*	10	0

25% surcharge on foreign cottons.

(*d*) TECHNOLOGICAL TESTS.

Under this head a brief account will be given of those tests which have been carried out in the Laboratory in connection with such technological investigations as have either been completed during the period under review or are in progress.

(1) *Effect of employing different degrees of compression in a bale on the fibre properties and spinning quality of cotton.*—This investigation, which was authorised by the Indian Central Cotton Committee, had been completed some time ago on 4 good quality Indian cottons, namely, Jayawant, Surat 1027 A. L. F., P. A. 289F and Cambodia Co. 2. During the period under review an account of it, containing all the results as well as a discussion of the freight rates charged on different routes for fully pressed and half pressed bales, was published in the form of a Technological Bulletin, Series A. A summary of this bulletin will be found under the head 'Publications.'

(2) *Optimum Drafts in the Fly Frames.*—Sometime back an investigation was undertaken at the Laboratory to ascertain the influence of different drafts and settings in fly frames on the spinning performance of a few Indian cottons. Arising out of this investigation, another investigation was undertaken in order to find out the optimum scheme of drafts and the best speeds in the fly frames suitable for P. A. 4 F cotton. In this investigation the speeds and the scheme of drafts normally employed at the Laboratory were compared with a number of other schemes with suitable variations in both, and the spinning behaviour of 4F cotton and the quality of the yarns obtained under each scheme was critically examined. Furthermore, the amount of machinery and labour required in connection with each scheme, was calculated so as to compare the cost of working the scheme under mill conditions. The results of this investigation were published during the period under review in the form of a Technological Bulletin, Series A, of which a summary will be found under the head 'Publications.'

In view of the practical importance of this problem it is proposed to extend it to other important Indian cottons.

(3) *Suitability of two cottons for purposes of mill mixings in relation to their fibre-characters.*—This investigation has been in progress in the Laboratory for some time past and has formed the subject of a very detailed study. The object of this study has been to ascertain, in an exact manner, the relative influence of the different fibre properties in determining the suitability of two cottons for purposes of mill mixings. For this purpose, each of the 5 good quality cottons, namely Surat 1027 A.L.F., Jayawant, P. A. 289 F, Cambodia Co. 2 and Kampala were spun pure and mixed in the proportion of 25% and 50% with the comparatively inferior types, P. A. 4F, Wagad, Broach Palej, and Punjab-Desi. Both the pure cottons and the mixtures were spun into suitable counts on 3-roller and 4-roller systems of spinning and the yarns obtained were examined for strength, regularity, extension, etc. Simultaneously, exhaustive tests were made on the fibres of

both the superior and the inferior cottons in which, besides the ordinary fibre properties, their wax content, clinging power, cell diameter, etc. were determined. This investigation is the first of its kind to be ever undertaken on such a scale and has yielded extremely interesting results which have been published in the form of a Technological Bulletin, Series A. A summary of this bulletin will be found under the head ' Publications.'

(4) *Empirical Relationships between count, lea strength and staple length of Indian cottons.*—Most practical spinners in their career come face to face with two problems of direct importance to the mills. The first of these problems is to estimate the yarn strength of a cotton in any specified count (without actually spinning it) from the known strength of a count into which it has been spun. The second problem is to make due allowance for the inevitable variations of the actual from the nominal counts. In addition to these, a problem of another type, which is also very important to the mills is the selection of a suitable cotton for spinning into a specified count possessing the requisite strength. It was found that the data collected in the Laboratory with regard to the standard Indian cottons over a number of years was capable of furnishing a solution to these three problems. Accordingly, two short notes were written and published in the *Indian Textile Journal*, one dealing with the selection of suitable cottons for spinning into specified counts, and the other dealing with the estimation of yarn strength from a known into an unknown count and the necessary corrections for variations between the nominal and the actual counts. Later, these results were fully expanded and discussed in a Technological Bulletin, Series A ; which was published during the period under review and of which a summary will be found under the head ' Publications.'

(5) *Effect of humidity on the spinning performance of Indian cottons.*—Arising out of a recommendation of the Conference between the practical Spinners and Carders and the Laboratory staff, the Technological Research Sub-Committee at its last meeting considered the question of the suitable humidity at which the spinning tests should be carried out at the Laboratory. At that meeting results available at two humidities, 60 % and 70 % R. H. for 8 standard cottons were presented, and, after discussion of these results, it was decided that this work should be extended by making similar tests on another 6 or 7 samples of trade cottons. Accordingly during the period under review samples of the following 6 cottons were obtained for this purpose and tests were carried out on them at the relative humidities.

1. 289F saw-ginned
2. Khandesh
3. Good N. T.
4. Panderkora (C. P. No. 1)
5. Nanded
6. Rajpipla.

A short note has been prepared on this subject giving the results for all the 14 cottons and is placed as a separate item on the agenda of the Sub-Committee.

(6) *Draw-frame speed tests.*—The same Conference suggested that the Technological Laboratory might carry out, in the interest of the industry, a thorough investigation on the effect of different speeds in the draw frame on the spinning quality of Indian cottons. Accordingly, the following 6 cottons, viz., Raman, Wagad, Broach Palej, P. A. 289F, Co. 2 and Jayawant, have been selected for this purpose and are being processed with 4 different draw frame speeds, namely, 340, 375, 450 and 520 r.p.m. The sliver obtained with each of these speeds for a cotton will be processed and spun under similar conditions and the yarns will be tested for strength, extension, appearance, etc. These tests are in progress.

(7) *Effect of storage on the quality of Indian cottons.*—At the last meeting of the Technological Research Sub-Committee a proposal by the writer was considered that in view of the possibility of large stocks of Indian cottons being carried over this year, an investigation might be undertaken at the Laboratory with a view to finding out the effect of storage under the conditions prevailing in Bombay godowns on the appearance and spinning quality of representative commercial types of Indian cottons. This proposal was accepted by the Indian Central Cotton Committee at its meeting held on the 26th/27th January 1938. Accordingly, 9 bales each of the following 6 cottons have been purchased and stored in Sewree in a warehouse of Messrs. Narandas Rajaram & Co., Bombay:

1. Bengals (Hansi)
2. Khandesh (Dhulia)
3. Punjab-American (Reiti)
4. Broach (Palej)
5. Surat (Rajpipla)
6. Jayawant (Compta)

Arrangements have been made in a local Pressing Factory situated within the Sewree compound for drawing of samples of cotton from these bales from time to time for purposes of tests. These samples are drawn in such a manner that although the arrangement of cotton layers in the body of the bale is not disturbed, yet the sample drawn is representative of the entire bale. This precaution was necessary in order to avoid any possible objection by the trade that by re-pressing the bale the grade or the quality of cotton had been impaired. In this connection my best thanks are due to Mr. R. G. Saraiya of Messrs. Narandas Rajaram & Co., who had not only very kindly placed at the disposal of the Laboratory a part of one of his godowns for purposes of storing these bales, but also gave very material help in the matter of deciding the best technique for drawing the samples and re-pressing the bales. The initial samples from these bales were drawn in May 1938 and the investigation will be brought to a close in 1940. During this period tests will be made on the lustre and strength of the cotton fibre, while samples drawn from time to time will be spun and tested for strength, elasticity, etc. of the yarns.

(8) *Deterioration of B. D. 8 cotton with lapse of time.*—Sometime back an investigation was completed at the Laboratory with a view to studying the effect, on the strength of fibres and the incidence of growth of fungoid and bacteria in the Broach cotton, of storage under different conditions of humidity. In view of the fact that B. D. 8 is now replacing the Broach cotton, a similar investigation was undertaken on B.D.8 cotton in which, in addition to the measurements mentioned above, the lustre of the cotton sample was also determined at regular intervals with an apparatus designed at the Laboratory. In addition to the tests on fibre for strength, lustre and intensity of micro-organismal growth, spinning tests are also made on samples drawn from the bale at regular intervals. This investigation is in progress.

(9) *Quality of lint in relation to ginning factors.*—This investigation had been in progress for some time past and during the period under review the experimental part of it has been completed. The effect of different speeds, different settings of the moving knife, different amounts of moisture in the *kapas*, different types of roller material, has been studied on 5 Indian cottons, representing a wide range of staple length. Measurements have been made on fibre properties and the amount of moisture present in the kapas before ginning and in the lint after ginning, on the quality of the ginned lint and the consumption of power during the process of ginning, etc. This work has involved the carrying out of a very large number of tests, and the results will now be analysed with a view to their publication in the form of a Technological Bulletin.

II. RESEARCH LABORATORY.

Fibre Testing Section.—During the period under review this section has been kept fully occupied with the determination of fibre properties of various samples received either for full tests or only for fibre tests. The following statement B gives the distribution of such small size samples on which only fibre tests were carried out at the Laboratory, while the large size samples on which both fibre and spinning tests were carried out have already been included in Statement A :—

STATEMENT B.

1. *The East India Cotton Association Ltd., Bombay.*—26 samples.
2. *A Mill, Bombay.*—8 samples of Sind-American and Egyptian cottons.
3. *A Mill, Bombay.*—One sample of drawing sliver.
4. *A Mill, Bombay.*—4 samples of Egyptian cottons.
5. *A Mill, Bombay.*—2 samples of slivers.
6. *A Firm, Bombay.*—6 samples.

7. *A Firm, Bombay.*—2 samples.

8. *A Firm, Bombay.*—2 samples of Dhrangadhra cottons.

9. *The Collector of Salt Revenue, Bombay.*—7 samples of cloth.

10. *The Cotton Breeder, Surat.*—14 samples of selections and segregates.

11. *The Cotton Breeder, Broach.*—14 samples of B.D.8 and other back crosses.

12. *A Firm, Dhrangadhra.*—4 samples.

13. *The Superintendent, State Gardens, Junagadh.*—One sample of Cambodia cotton.

14. *The Assistant Director of Agriculture, Chitaldrug.*—One sample of strain.

15. *The Director of Agriculture, N.W.F.P., Peshawar.*—8 samples of long staple cottons.

16. *The Extra Assistant Director of Agriculture, Kurrum Valley, Kohat.*—6 samples of Giza and other long staple cottons.

17. *The Agricultural Officer, Baluchistan, Quetta.*—One sample of Kandhar cotton.

Majority of the tests carried out on these small size samples were of a routine nature, but there are some among them which are worthy of special mention. They are as follows :—

(1) *Cultivation of long staple cottons in N.W.F.P.*—27 samples of long staple cottons, belonging to 7 varieties and grown in three different places in the N. W. F. Province, namely, Bannu, Peshawar and Parachinar, were received for fibre tests. The tests on these samples indicated that their mean fibre length ranged from 1.04″ to 1.4″, while the fibre-weight per inch varied from 0.100 to 0.154 $\times$ 10^{-6} oz. The analysis of variance was applied to the results for the different varieties grown at different localities, and it was found that the effect of locality as well as the differences between the different varieties were both significant. It was found that the samples grown at Parachinar possessed, on the whole, the longest staple, those from Peshawar took the second place, while those from Bannu were last in this respect. As regards fibre-weight per inch, however, the samples grown at Bannu were found to be, on the whole, finer than those grown at either Peshawar or Parachinar, the average difference between the two latter places being insignificant. Among the varieties which have been tried in these three places, Sakha 4 and Giza 26 gave, on the whole, best results, while Giza 19 proved shorter and very much coarser than the other varieties.

(2) *The effect of different types of gins on fibre.*—Four samples, belonging to 2 cottons, were received from a local firm. Each of these was ginned on two different gins, and the firm wanted to know the relative merits of

the two gins employed. The necessary tests were carried out and a report was issued. The same firm sent another two samples of cotton not only for a determination of their fibre characters, but also for determining their ginning percentage, lint out-turn, etc., in the Laboratory. The necessary tests were made and a full report was supplied to the firm.

Mr. N. Hari Rao, in addition to supervising the work of the Fibre Testing Section, continued with the systematic study of the fibre properties of those cottons which had shown striking anomalies in their spinning behaviour. It may be stated, in this connection, that the prediction formula developed at the Laboratory for Indian cottons is found to be applicable, within a reasonable degree of accuracy, to about 80 per cent. of the cottons, while the remaining 20 per cent. exhibit fairly large differences between the actual and the predicted values of the highest standard warp counts. An attempt is now being made to find out the fundamental causes of these large differences by examining other fibre properties such as swollen diameter, fibre-length irregularity, variability of strength, effect of twist on strength, etc. Out of the cottons selected for this purpose, some 15 have already been examined in this manner and the results obtained have yielded very interesting information regarding the part played by these fibre properties in determining the spinning behaviour of these cottons. It is proposed to extend these tests to another 10 or 15 cottons before analysing the results. This work is in progress.

Physics Section.—Mr. R. S. Koshal.—The work of Mr. Hari Rao, referred to above, brought out, among other things, the desirability of doing systematic work on swollen diameter of Indian cottons. In view of the fact that very little work on this property of Indian cottons had been done, it was necessary in the first place to undertake a small investigation with a view to finding out the size of a reliable sample for this property and the extent of its variation in inter-related and unrelated strains. This work was undertaken by Mr. Koshal, who completed the experimental part of it during the period under review. A short note on this work will be written in due course for publication.

Mr. Koshal also continued with his investigation of the study of the relationship between the fibre-weight per inch and fibre-maturity of some 120 samples of parents and F_1 strains of Malvi cottons and the relative effect of heredity and environment on the former property. This investigation had to be suspended owing to the fact that, at the desire of the President, Indian Central Cotton Committee, Mr. Koshal's services were placed at the disposal of the Punjab Government for special work in the Punjab.

Mr. C. Nanjundayya.—During the period under review Mr. Nanjundayya completed writing up of the two papers dealing with the investigations on which he had been engaged for some time past. The first paper dealt with the variation of strength and weight per inch of fibre with the group-length of a cotton and was published as a Technological Bulletin, Series B,

in the *Journal* of the Textile Institute, Manchester. A summary of this paper will be found under the head " Publications." The second paper dealt with the new attachment which was recently designed at the Laboratory for the purpose of determining the percentages of fibres of different lengths present in a sample of cotton and the proportion of fibres below any specified length. This paper was also published in the *Journal* of the Textile Institute and its summary will be found under the head " Publications."

Mr. Nanjundayya continued with his investigation on the relationship between fibre diameter and wall thickness and wax content of Indian cottons which he commenced some time ago. At the same time Mr. Nanjundayya was also entrusted with another investigation which was sanctioned by the Committee at its last meeting. The object of this investigation is to study, in a thorough manner, the effects of storage on the quality of Indian cottons. A brief account of this investigation has already been given under the head " Technological Tests," and Mr. Nanjundayya has been entrusted with the measurements so far as they relate to fibre strength and lustre of cotton.

Dr. K. R. Sen.—During the period under review Dr. K. R. Sen completed his investigation on the suitability of Indian cottons for purposes of mill mixings. The results of this investigation, so far as they relate to the spinning quality of the mixtures and their relationship with the fibre-properties, have already been referred to under the head " Technological Tests," and a summary of the bulletin, issued on this subject will be found under the head " Publications." In the course of this investigation a fairly intensive study was made of the clinging power of the cotton fibre, its relation to other physical properties and the effect of some physical factors upon it. The results of this investigation were also written up during the period under review and were sent up for publication as a Technological Bulletin, Series B, in the Journal of the Textile Institute. A summary of this bulletin will also be found under the head " Publications." In addition to this work, it was also found that the clinging power of the components of a mixture appeared to have considerable effect upon strength regularity of the yarns spun from it. Accordingly, measurements were made on the clinging power of cottons and staple fibres and the strength regularity of the yarns, spun from their mixtures. The results of these measurements have also yielded interesting information which is now being written up for publication as a short note. This work has brought to a close Dr. Sen's connection with the Indian Central Cotton Committee and especially his connection with the Technological Laboratory. During his stay at the Laboratory he has carried out three investigations which have given us insight into the relative importance of the various fibre properties in regard to their effect upon the " mixing quality " of cottons, the effect of some physical conditions upon the clinging power of cotton and its relationship with other properties of the fibre, and finally the influence of clinging power on the strength regularity of yarns. These researches have added considerably to our knowledge on these subjects and I would like to take this opportunity of acknowledging the industry

and diligence with which Dr. Sen carried on his work during his stay at the Laboratory.

Chemistry Section.—As has been stated elsewhere, a beginning has already been made in the matter of opening up a small Testing House attached to the Laboratory for the use of the commercial bodies. In connection with this Testing House, a number of samples were received for determination of the percentage of sizing and finishing materials. As no work on such materials had been done previously, it was necessary to lay down the technique of the method and the size of reliable samples by carrying out a systematic investigation. This work was undertaken by Mr. D. L Sen, who had given some time and attention to this problem during his study leave in the College of Technology, Manchester. As a result of this work the proper technique to be followed with materials containing widely different percentages of the sizing and finishing material has now been laid down.

In addition to this work, Mr. D. L. Sen continued with his investigation on the absorption of dyes by Indian cottons. He has now completed this work with 4 dyes on 7 standard Indian cottons and these tests have given some very interesting results. It has been found that an increase in the molecular weight of dyestuffs is accompanied by a reduction in the maximum dye absorption of cotton, that with dyes of heavy molecular weight the variation in the dye absorption is small from cotton to cotton, that the dye absorption of wax-free cotton is very much lower than that of the raw material showing that although the wax on cotton has no affinity for direct dyes it probably plays the role of an absorptive medium for dyes, that the non-cellulosic colouring material present in the cotton retards the absorption of dyes and that among the 7 cottons selected for this investigation, Mollisoni has the lowest dye absorption. This investigation has now been extended to other dyes.

Dr. Lavji Thoria.—During the period under review Dr. Thoria completed his investigations on the alpha-cellulose and ash content of such samples of linters and fuzz as were available in the country, of samples of cotton wastes, fly and hard waste and the relative merits of giving a mechanical pre-treatment to very dirty cottons. The results of this investigation have been written up in a report which is placed before the Committee as a separate item on the agenda.

Mr. M. U. Parmar continued with his investigation on the effect of different treatments of kier boil and bleach on the strength and elasticity of cotton yarns and upon the viscosity of their cuprammonium solutions. For the purpose of this investigation sufficient quantities of yarns were spun from each of the four good-quality Indian cottons, Jayawant, 1027 A.L.F., P. A. 289F and Cambodia Co. 2 and sent to the Department of Chemical Technology, University of Bombay, where they were given 7 different treatments of kier boil and three different treatments of bleach. The strength and viscosity tests on these yarns were completed during the period under

review and the analysis of variance was applied to the results. This analysis gave the required information regarding the relative merits of the different treatments and the differential response of the cottons to these treatments. These results were discussed, at considerable length, with the Head of the Department of Chemical Technology, and it was decided that, in order to elucidate several important points, it was necessary to make further tests on more samples of yarns. Accordingly, some 80 samples of yarns were given different kier boil and bleach treatments and tests on them are now in progress.

Mr. G. Rama Rao continued, for part of the period covered by this report, with the determination of the swollen diameter of cotton with the new method. He was unable to complete the work by writing a full report on it owing to having resigned his scholarship with effect from 20th January 1938. This work will be completed as soon as opportunity permits.

Microscopy Section.—Mr. A. N. Gulati continued with his investigation on the deterioration of B.D. 8 cotton with time, and also on the study of the relative effects of heredity and environment on fibre-maturity in parents and F_1 strains of Malvi cottons. During the period under review the tests on the parents and F_1 strains of Malvi cottons was completed, and have yielded some very interesting results. In the light of these results, it has been found desirable to extend this work to the F_2 strains for which fortunately material is also available from the Institute of Plant Industry, Indore. In view of the fact, however, that the work on the F_2 strains will take some considerable time, the results already obtained for the parents and the F_1 strains will be written up in the form of a bulletin, which will be published without waiting for the results on the F_2 strains.

The work on the deterioration of B.D. 8 cotton with time has shown that under controlled conditions there is no increase in the incidence of micro-organismal attack at humidities below 60% R. H. In the further work on this problem, therefore, the low humidities have been dropped and work has been concentrated on humidities above 60% R. H. Since in the room it is not possible to isolate the effect of humidity from that of temperature, it may be necessary, after the results of these tests are available for analysis, to eliminate the effect of temperature by placing the material inside an incubator. This work is in progress.

III. MOISTURE TESTING SECTION.

During the period under review tests for moisture content were made on 142 samples. The details of these tests are as follows :—

Technological samples	91
Trade samples	51
Total	142

The technological samples referred to above are mostly those in connection with the ginning investigation, in which the moisture contents of the *kapas* as well as the ginned lint have been determined. The total number of samples on which moisture tests have been made in the Moisture Testing Section since its inception is 1,012.

It will be remembered that on the last occasion when the report on the results of the moisture tests was placed before the Moisture Tests Sub-Committee of the East India Cotton Association Ltd., it was felt that sufficient data was not available with regard to the moisture content of long staple Indian cottons. Accordingly, arrangements were made with several leading firms for the supply of samples of long staple cottons on which these tests could be carried out in the Laboratory. During the period under review this work was brought to a completion, and a supplementary report, embodying the results of over 65 samples of long staple cottons, was prepared and sent to the East India Cotton Association. This report was considered by the Moisture Tests Sub-Committee of the Association, who passed the following resolution on it :—

> " The Moisture Tests Sub-Committee have also passed a vote of thanks to you and to Mr. D. L. Sen for the co-operation extended to the Association in carrying the moisture tests during the last six years."

IV. PUBLICATIONS.

The following are the publications of the Laboratory issued during the period under review :—

I. *Technological Bulletins, Series A, Nos.* 38 *to* 43.

(1) Technogical Bulletin, Series A, No. 38, " Technological Reports on Trade Varieties of Indian Cottons, 1937 " by Nazir Ahmad, M.Sc. Ph.D., F.Inst.P.

(2) Technological Bulletin, Series, A No. 39, " Technological Reports on Standard Indian Cottons, 1937 " by Nazir Ahmad, M.Sc., Ph.D., F.Inst.P.

(3) Technological Bulletin, Series A, No. 40, " The Effect of Different Degrees of Compression on the Fibre Properties and Spinning Quality of Indian Cottons," by Nazir Ahmad, M.Sc., Ph.D., F.Inst.P.

(4) Technological Bulletin, Series A, No. 41," Spinning Tests on Punjab-American 4F Cotton with Different Schemes of Drafts in the Speed Frames," by Nazir Ahmad, M.Sc., Ph.D., F. Inst. P.

(5) Technological Bulletin, Series A, No. 42, " Empirical Relationships between Count, Lea Strength and Staple Length of Indian

Cottons " by V. Venkataraman, M.A., and Nazir Ahmad, M.Sc., Ph.D., F. Inst. P.

(6) Technological Bulletin, Series A. No. 43, " Suitability of Two Cottons for purposes of Mill Mixings in relation to their fibre-characters" by Nazir Ahmad, M.Sc., Ph.D., F. Inst. P., and K. R. Sen, D.Sc.

II. *Technological Bulletins, Series B, Nos. 23 to 25.*

(1) Technological Bulletin, Series, B No. 23, " A Device for Determining the proportion by weight of Fibres of Different Lengths in a sample of Cotton " by N. Ahmad, M.Sc., Ph.D., F. Inst. P., and C. Nanjundayya, M.Sc.

(2) Technological Bulletin, Series B, No. 24, " Studies in the variation of strength and weight per inch with group length of cotton fibres " by C. Nanjundayya M.Sc., and N. Ahmad, M.Sc., Ph.D., F. Inst. P.

(3) Technological Bulletin, Series B, No. 25, " The Clinging Power of Single Cotton Fibre in relation to its physical properties " by K. R. Sen, D.Sc., and N. Ahmad, M.Sc., Ph.D., F. Inst. P.

In addition to the above bulletins the following papers were read at the Jubilee Session of the Indian Science Congress held at Calcutta in January 1938 :

1. " Variation in Fibre-Strength and Fibre-Weight per inch with the Group Length of Fibres in Indian Cottons " by C. Nanjundayya, M. Sc., and Nazir Ahmad, M.Sc., Ph.D., F. Inst. P.

2. " The Effect of Twist on the Strength and Length of Cotton Fibre " by H. Navkal, M. Sc. and Nazir Ahmad, M. Sc., Ph. D., F. Inst P.

3. " A device for determining the proportion by weight of fibres of different length in a sample of cotton " by Nazir Ahmad, M.Sc., Ph.D., F. Inst. P., and C. Nanjundayya, M.Sc.

4. " Clinging Power of Cotton fibre in relation to its other Physical Properties by K. R. Sen, D.Sc. and Nazir Ahmad, M.Sc., Ph.D. F. Inst. P.

Furthermore, a short note on the bad effect of mildew attack on cloth and the method of recovering the damaged cloth was published in the *Indian Textile Journal* during the period under review.

The following Technological Circulars were issued from the Laboratory during the period under review:

Technological Circulars Nos. 302-354 *as under*:

Circular No.	Title.	Date of Publication.
302	Spinning Test Report No. 848 on samples of Westerns Cotton, 1936-37	June 1937.
303	Technological Report on Cambodia Co. 2 (Cambodia 440), 1936-37	June 1937.
304	Spinning Test Report No. 850 on samples of Bijapur cotton, 1936-37	June 1937.
305	Spinning Test Report No. 851 on samples of Farm Westerns Cotton, 1936-37	June 1937.
306	Spinning Test Report No. 852 on samples of Bagalkote cotton, 1936-37.	June 1937.
307	Spinning Test Report No. 854 on samples of Upland cotton, 1936-37	June 1937.
308	Spinning Test Report No. 859 on samples of A. R. Busoga cotton, 1936-37	July 1937.
309	Spinning Test Report No. 860 on samples of A. R. Kampala cotton, 1936-37	July 1937.
310	Spinning Test Report No. 862 on samples of Westerns cotton, 1936-37	July 1937.
311	Spinning Test Report No. 863 on samples of Northern Cambodia cotton, 1936-37	July 1937.
312	Spinning Test Report No. 864 on samples of Navsari cotton, 1936-37.	July 1937.
313	Spinning Test Report No. 865 on samples of Tiruppur Cambodia cotton, 1936-37.	July 1937.
314	Spinning Test Report No. 866 on samples of Miraj cotton, 1936-37.	July 1937.
315	Spinning Test Report No. 869 on samples of Dholleras cotton, 1936-37.	July 1937.
316	Spinning Test Report No. 871 on samples of Kumpta cotton, 1936-37	July 1937.
317	Spinning Test Report No. 872 on samples of Karunganni cotton, 1936-37	July 1937.
318	Spinning Test Report No. 873 on samples of Kalagin cotton, 1936-37	July 1937.
319	Spinning Test Report No. 874 on samples of Tinnevelley cotton, 1936-37	July 1937.
320	Spinning Test Report No. 875 on samples of Cambodia cotton, 1936-37	July 1937.
321	Spinning Test Report No. 876 on samples of A. R. Jinja cotton, 1936-37.	July 1937.
322	Spinning Test Report No. 882 on samples of Latur cotton, 1936-37	August 1937.
323	Spinning Test Report No. 912 on samples of Bengals cotton, 1937-38	January 1938.
324	Spinning Test Report No. 913 on samples of Moglai cotton, 1937-38	January 1938.
325	Technological Report on Verum 262 (Nagpur) 1937-38	January 1938.

Circular No.	Title.	Date of Publication.
326	Spinning Test Report No. 918 on samples of Khandesh cotton, 1937-38.	February 1938.
327	Technological Report on Late Verum (Nagpur), 1937-38.	February 1938.
328	Spinning Test Report No. 919 on samples of Berar cotton, 1937-38	February 1938.
329	Spinning Test Report No. 921 on samples of Punjab-American cotton, 1937-38	February 1938.
330	Spinning Test Report No. 922 on samples of C. P. No. 1 cotton, 1937-38	February 1938.
331	Technological Report on Umri Bani, 1937-38	February 1938.
332	Spinning Test Report No. 925 on samples of Ujjain cotton, 1937-38.	March 1938.
333	Spinning Test Report No. 926 on samples of Khandesh cotton, 1937-38	March 1938.
334	Spinning Test Report No. 927 on samples of Ujjain cotton, 1937-38.	March 1938.
335	Spinning Test Report No. 931 on samples of Farm Westerns cotton, 1937-38.	March 1938.
336	Technological Report on V. 434 (Akola), 1937-38. ..	March 1938.
337	Spinning Test Report No. 934 on samples of Broach cotton, 1937-38	March 1938.
338	Technological Report on Verum 262 (Akola), 1937-38 ..	March 1938.
339	Spinning Test Report No. 939 on samples of Bailhongal cotton, 1937-38	April 1938.
340	Spinning Test Report No. 940 on samples of Miraj cotton, 1937-38	April 1938.
341	Technological Report on Punjab-American 289F, 1937-38	April 1938.
342	Technological Report on Punjab-American 4F, 1937-38	April 1938.
343	Spinning Test Report No. 942 on samples of Westerns cotton, 1937-38.	April 1938.
344	Spinning Test Report No. 943 on samples of Hubli Kumta cotton, 1937-38.	April 1938.
345	Technological Report on Sind Sudhar, (289F-1), 1937-38	May 1938.
346	Spinning Test Report No. 945 on samples of Tiruppur Cambodia cotton, 1937-38	May 1938.
347	Spinning Test Report No. 946 on samples of Karunganni cotton, 1937-38	May 1938.
348	Spinning Test Report No. 947 on samples of Surat cotton, 1937-38.	May 1938.
349	Spinning Test Report No. 948 on samples of A. R. Kampala, 1937-38.	May 1938.
350	Spinning Test Report No. 950 on samples of Tiruppur Cambodia cotton, 1937-38.	May 1938.
351	Spinning Test Report No. 952 on samples of A. R. Jinja cotton, 1937-38.	May 1938.
352	Spinning Test Report No. 953 on samples of A. R. Busoga cotton, 1937-38	May 1938.
353	Spinning Test Report No. 954 on samples of Latur cotton, 1937-38.	May 1938.
354	Spinning Test Report No. 956 on samples of Broach cotton, 1937-38.	May 1938.

Summaries of Technological Bulletins, Series A, Nos. 40, 41, 42 and 43, and Series B, Nos. 23, 24 and 25, and of a note on mildew attack and its possible remedies are given below :—

(1) *Technological Bulletin, Series A, No.* 40, "*The Effect of different degrees of compression on the Fibre-properties and spinning quality of Indian cottons*". In India, as in other principal cotton growing countries, the dimensions, weight and density of the cotton bales show considerable variations. In view of the fact that the proportion of medium and long-staple cottons in the Indian cotton crop is steadily increasing, the question was raised whether compression of such cottons into bales having a density of 40 lbs. to the cu. ft. produced any deleterious effects, especially as the American and the Egyptian cottons are not usually pressed to such high densities. Accordingly, tests were made on P. A. 289F, Jayawant, Surat 1027 A. L.F. and Cambodia representing four of the good quality Indian cottons. Three bales of each cotton weighing 400 lbs., 300 lbs., and 200 lbs. respectively were pressed to the same size and stored for about six months, after which samples for tests were drawn from them. The results of tests on these samples showed that pressing the bales to a density of 20 lbs. per cu. ft. might yield slightly better results in a few cases, though the effect is not general and its magnitude, in any case, is very small. The question whether this small improvement in the quality of the yarns is at all compatible with the higher cost of transport, etc., for the low density bales is discussed and the conclusion is drawn that reducing the density of the bale by diminishing the quantity of cotton in it would be an unprofitable step. Furthermore, when the bales are likely to be exported to foreign countries by routes on which the shipping freight is made on the basis of volume occupied by them, there also a decrease in density would be an uneconomic proposition.

The cottons used in this investigation were good quality types which are usually supplied in a comparatively clean condition. The position, however, may be different for the dirty and leafy cottons and for such cases it would be necessary to undertake another investigation.

(2) *Technological Bulletin, Series A, No.* 41, "*Spinning tests on Punjab-American 4F cotton with different schemes of drafts in the speed frames.*" A 100-lb. sample of P. A. 4F was passed through the blow-room and at the finisher scutcher was divided into 5 equal-sized laps, A, B, C, D and E which were carded separately to yield sliver of 0.15, 0.13, 0.11, 0.175 and 0.19 hank respectively. Each sliver was given two heads of drawing with a draft of 5.93 in each drawing frame. These were then processed with 15 different schemes of drafts in the speed frames and spun into 20's counts and the yarns obtained were examined for strengh, evenness, etc. The following conclusions are drawn :—

(*i*) The least number of breakages in the ring frame was obtained by the normal scheme of drafts. They were found to increase as the finisher sliver became coarser and in such cases relatively fewer breakages were

obtained when the additional draft was uniformly spread out over the four frames. They were also more numerous if, consequent on the omission of a frame, the drafts in the other frames exceeded a certain value.

(*ii*) When the hank number of the sliver was decreased, the yarns were found to become somewhat less even, and the effect, as a rule, is more marked if the extra draft required is concentrated in fewer machines. The yarns spun from the lighter sliver D (0.175 hank) with the omission of the intermediate frame are somewhat less even than those obtained from the heavy sliver C. (0.11 hank). This tendency to yield less even yarns was shown in a greater measure by the still lighter sliver E (0.19 hank). This feature is probably due to a poorer orientation of the fibres caused by a reduction in the lateral cohesive forces arising out of the attenuation of the sliver.

(*iii*) The best strength results were given by the scheme of drafts normally employed at the Laboratory. Further, the variation in yarn-strength by using different schemes of drafts in the fly-frames and the ring frame was found to be quite small, for the limits of drafts employed in these tests. When somewhat high drafts are necessitated either by the use of a coarse roving or by the omission of a process, the strength is likely to fall, beyond certain values of the drafts, the decrease in strength being greater when the extra draft is concentrated in the ring frame than if it is spread out in all the four machines.

(*iv*) The effect of employing different schemes of drafts, in relation to yarn strength on the one hand and the output and the number of spindles on the other are discussed, and some typical cases in which without any appreciable reduction in yarn strength, either the output can be increased or a certain amount of saving in labour, supervision, etc., can be effected are considered in detail.

(3) *Technological Bulletin, Series A, No.* 42, "*Empirical Relationships between count, lea strength and staple length of Indian Cottons.*"—In Part I of this Bulletin, a formula has been derived as a result of statistical analysis of the fibre-properties and spinning performance of over 150 samples of Standard Indian cottons, which enables a spinner to find out the staple length of an Indian cotton suitable for spinning, with medium twist, warp yarn of a specified count possessing a given strength.

In part II of this bulletin, a second formula has been derived as a result of analysis of a very large number of lea strength results which would enable a spinner (1) to calculate the strength of any count (which is not spun) from the known strength of one count into which an Indian cotton has been spun and (2) to calculate the exact strength of the nominal count from the known strength of the actual count spun from an Indian cotton.

(4) *Technological Bulletin, Series A, No.* 43, "*Suitability of Two cottons for purposes of mill mixings in relation to their fibre-characters.*"—A detailed investigation was undertaken in order to study the relative importance of fibre-properties in determining the suitability of two cottons for purposes of mixings. For this purpose, 5 superior types, viz., 1. Surat 1027 A. L. F., 2. Jayawant, 3. P. A. 289F, 4. Cambodia Co. 2 and 5. Kampala were spun pure. Each of these was then mixed with 25 per cent. and 50 per cent. of the four inferior types, namely 1. P.A. 4 F, 2. Wagad, 3. Broach Palej and 4. Raman (Punjab-desi) and the mixtures were spun on 3-roller and 4-roller systems of spinning into suitable counts. All cottons were examined for a large number of fibre-properties and the yarns obtained from the pure cottons and the mixtures were tested for strength, evenness, etc. The following conclusions are drawn from the results of this investigation.

(1) *Waste losses.*—If a dirty cotton is used as one of the components it would push up the blow-room loss and consequently the total waste loss of the mixture. High proportion of short fibres in one of the components of a mixture is conducive to high aggregate wastiness.

(2) *Yarn neppiness.*—In the case of these mixtures yarn neppiness is found to behave as an additive property, the degree of neppiness of the yarns spun from a mixture depending upon the neppiness of its components. Furthermore, the presence of a certain amount of short-stapled cotton, provided it is free from neps, has the effect of reducing the degree of neppiness of yarns spun from a mixture, which is especially noticeable in cases where the superior cotton happens to suffer seriously from this defect.

(3) *Yarn evenness.*—With medium long varieties as the basic cottons, if the mixture is spun into a count lying well within its spinning capacity, the presence of the inferior cotton upto 25% does not bring about such a reduction in the evenness of the yarns as is perceptible to the eye, but if the mixture is spun into a higher count the effect of the inferior cotton in reducing the evenness of the yarns becomes noticeable. With long cottons such as Kampala as the basis, the effect of the inferior variety in lowering yarn evenness becomes noticeable even in counts which lie well within the spinning performance of the mixture.

(4) *Yarn strength.*—For purposes of determining the suitability of cottons for mixing purposes, the individual performance of the components is a useful but not a sufficient guide as the performance of the mixture depends on the differences in the fibre-characters of its components.

25 *per cent. Mixtures.*

(*i*) The disadvantage of low staple length of the inferior cotton in a mixture may, to a large extent be overcome by choosing a cotton which differs less radically from the superior cotton in respect of ribbon-width, fibre-weight and specially clinging power. Even the wax content of the

inferior cotton may be less, giving it a harsh feel. This conclusion should be of special interest to the mills, as the cottons are primarily bought on the basis of length and feel. It shows that by determining the mean fibre-weight and clinging power of their cottons the mills can obtain valuable information regarding the probable performance of their mixings and thereby effect savings in initial cost.

(*ii*) An increase in the ribbon-width and clinging power and a decrease in the wax content of the superior cotton have an adverse effect on the yarn-strength of mixture made from it with a given inferior cotton. This conclusion should also be of importance to the mills as they are apt to ignore such properties as fibre-weight per inch, clinging power and wax content, which are found to have an important bearing on the spinning quality of mixtures.

(*iii*) Upto a limit of 25 per cent. of the short cotton its effect on the performance of the mixture is small if the superior component possesses fine, waxy and slippery fibres but this effect becomes appreciable if the fibres of the superior component are coarse and possess high clinging power and low wax content. Thus, two cottons having practically the same staple length and same fibre-diameter, may behave quite differently when each is mixed with a third cotton, the reason for the difference in their behaviour lying in the fibre-weight per inch, clinging power and wax content. The relative contribution of each of these three properties on the spinning behaviour can only be ascertained by further work.

(*iv*) If the inferior cotton selected for a mixture is such that its ribbon-width, mean fibre-weight per inch and wax content lie close to those of the superior cotton, we should expect good results from the mixture. On the other hand, should there be a wide disparity between the two cottons in respect of these properties, the results will not be so good, even though the inferior cotton may have a relatively longer staple and may consequently be bought at a higher price in the market.

(*v*) These results bring out very clearly the undesirability of mixing cottons indiscriminately outside a mill mixing room. Under such conditions no regard is likely to be paid to their relative fibre-properties, which, as we have seen, determine the suitability or otherwise of two cottons to mix in a satisfactory manner. Thus, a short cotton possessing coarse and sticky fibres may be mixed with another possessing relatively fine and slippery fibres, pulling down its performance by a much greater amount than would be the case with an equally short but fine cotton.

(*vi*) The results obtained by us show definitely that differences in fibre-weight per inch and ribbon-width of fibres are very important in determining the suitability of two cottons for mixing purposes, and that differences in clinging power should also be regarded as an important auxiliary character, especially for low counts.

50 *per cent. Mixtures.*

(*i*) The extent by which the yarn strength is pulled down varies according to the fibre-properties of the inferior cotton in relation to those of the basic cotton.

(*ii*) The good effect of low ribbon-width and fibre-weight, which may overcome the adverse effect of short staple in an inferior cotton may not be fully operative if the fibres of the superior cotton possess high fibre-weight per inch and low wax content.

(*iii*) If one of the components in a mixture happens to possess very heavy, coarse and sticky fibres as compared with the superior cotton, even the good qualities of the superior cotton would not be able to extract satisfactory results from the mixture.

Effect of additional roller.

(*i*) The effect of an additional roller in exerting better fibre-control is, on the whole, less with mixtures containing finer and lighter fibres and greater with mixtures containing the same proportion of cottons possessing relatively high fibre-weight per inch, ribbon-width and clinging power.

(*ii*) The control of fibres in the 4-roller system increases as the number of fibres in a cross-section of the roving is reduced, but that this effect is neutralised if the mixture contains a large proportion of short and coarse fibres.

(5) *Technological Bulletin, Series, B No.* 23, "*A device for determining the proportion of fibres of different length in a sample of cotton.*"—The Cotton Stapling Apparatus, designed at the Technological Laboratory (Bombay) sometime ago, gives the mean length and weight per unit length of a cotton. It, however, suffers from the limitation that it does not give the frequency distribution of length, a knowledge of which is often useful not only to the research worker but also to the trade and industry. With a view to remedying this deficiency, a new attachment to the Stapling Apparatus has now been designed. The description and mode of operation of this device are given in this paper. Further, the results of experiments, conducted with a view to determining the degree of agreement with the other instruments, in vogue, are also given. It is shown that this device is capable of yielding consistent results which agree well with those given by other methods.

(6) *Technological Bulletin, Series, B, No.* 24, "*Studies in the Variation of Strength and Weight per inch with group length of cotton fibres.*"—The present investigation was undertaken with a view to studying the variation in the breaking load and the fibre-weight per inch of the differrent length-grades in a cotton. For this purpose a representative sample of cotton was fractionated into its constituent group lengths with a Baer Sorter. The breaking load of whole fibres was determined with a Balls' Magazine Hair Tester,

modified in some respects. Generally 500 fibres were tested for each length-grade, but the available number (less than 500) was exhausted in the case of the extreme length-grades. Out of the nine cottons selected to cover a wide range of fibre-properties, seven were standard Indian cottons and two exotic varieties. Successive lengths differing by an eighths of an inch were tested for Nandyal 14, while for the remaining cottons, the alternate groups differing by $\frac{1}{4}''$ were tested. Furthermore, the weight per inch of each group length of each cotton was also determined by weighing 1,000 whole fibres.

From the results obtained in the present investigation the following conclusions are drawn :—

(1) The mean breaking load decreases with an increase in group-length ; the range of variation between the longest and the shortest groups being 39% to 128% in different cottons.

(2) The frequency distributions, which are generally asymmetrical and skew, indicate a large preponderance of weak fibres in each group-length. Nearly 90% of the fibres in the longest groups have breaking load below 3.9 gms.

(3) Several frequency constants have been worked out and they lead to the following conclusions :—

(*a*) The coefficient of variation for all length-grades in a cotton is of the same order (60-65%) as that obtained by the previous workers for the unsorted sample, but the long staple cottons show greater irregularity specially in the shortest lengths.

(*b*) The skewness exhibits a very slight tendency to increase with a decrease in group length.

(*c*) Pearson's Type I curve shows the best fit with the frequency distributions.

(4) The difference in breaking load between any two group-lengths in a cotton is generally significant while those pairs which show non-significant differences are usually the adjacent lengths.

(5) The relationship between mean breaking load and the length-grade of a cotton is non-linear and the correlation coefficients ranging from —0.15 to —0.30, though small, are significant. This conclusion confirmed by coefficients of association indicates that the medium staple cottons do not exhibit such a close relationship between the two properties as the longer staple cottons.

(6) The curves of mean breaking load plotted against group-length are nearly similar for all cottons, and are of hyperobolic type, represented by the equation $L^NS=K$, where L=group-length, S=mean breaking load, N and K are constants for a cotton. General relationships between N and K and the mean staple length or the mean fibre-strength of a cotton have been

found and from a knowledge of either fibre property, the mean strength corresponding to each group-length of a cotton can be calculated.

(7) The effect of increasing the mean length of a cotton as in breeding by about 2.7% is to decrease its mean fibre strength by 12.5%.

(8) The mean breaking load of 1 cm. length, for each group-length is calculated from the experimental value for whole fibres by using Peirce's formula derived originally for cotton yarns. The calculated and the experimental values agree fairly well, though the former are generally lower than the latter. Probable causes of the discrepancy are discussed.

(9) Regarding the variation of fibre-weight per inch with different group-lengths, it is found that:

(*i*) The fibre-weight per inch decreases with an increase in group-length, except for the two longest cottons which have very nearly constant fibre-weight per inch in the different group-lengths; and Nandyal 14, which behaves in a somewhat erratic fashion.

(*ii*) In conformity with Iyengar and Turner's observation, *Hirsutum* cottons have smaller fibre-weight per inch in the longer group-lengths while the *Indicum* cottons do not show this feature to an appreciable extent. But the *Herbaceum* cottons show larger variations than those observed by Iyengar and Turner.

(10) The intrinsic strength is practically constant for all group-lengths in Sudan Sakel and Sea Island, while in the remaining cottons with the exception of Jayawant and C. A. 9, a mild tendency is exhibited by it to decrease with length. The correlation coefficients between mean fibre strength and fibre-weight per inch obtained by pooling together all values, irrespective of cottons are +0.735 and +0.835, the former including all cottons and the latter all but Nandyal 14. Thus 50-70% of the variation in fibre strength is accounted for by variation in fibre-weight per inch while the remainder is explained as being due to the occurrence of bruises, cracks, pits, etc. on the fibre surface.

(11) Examination of the probable causes for the observed weak relationship between mean length and mean strength revealed the following points:

(*i*) Since the curve on which unit fibre-weight is plotted against group-length is linear only upto a certain group-length, the amount of cellulose deposited in the longest fibre is not in proportion to its length. The deficiency appears to increase with the mean fibre-weight per inch or fineness of the cotton.

(*ii*) The rate of increase of unit fibre-weight with group-length is greater with the shorter than with the longer cottons.

(7) *Technological Bulletin, Series B, No.* 25, *"The Clinging Power of Single Cotton Fibre in relation to its physical-properties"*. This investigation was carried out with a new apparatus designed with a view to measuring accurately the clinging power of cotton fibres at different angles of slippage.

The important conclusions drawn from the data obtained are summarised below :

(1) The fibres of a coarse cotton possess rougher surface than those of a fine cotton. Beyond a certain limit of coarseness the roughness of surface increases at a faster rate than coarseness. Inversely, above a certain degree of fineness, roughness of fibre surface alters very slowly.

(2) The extent to which clinging power may be expected to increase with the number of convolutions per inch is largely offset by the irregularity of spacing of the convolutions and the distributions of surface corrugations.

(3) Upto a limit the intrinsic clinging power increases with wax per unit surface. Beyond this limit it assumes a more or less steady value. The implications of these phenomena are discussed.

(4) High humidities tend to reduce clinging power. A similar effect is produced by low temperatures. It is probable that these phenomena are caused by alteration in the amount of moisture residing on the fibre surface.

(5) At low pressures between the pads the co-efficient of friction geneally decreases as pressure is increased. This is probably due to imperfect contact. Good contact is established at a pressure ranging between 5 and 6 cms. of mercury for different cottons ; beyond this point the co-efficient of friction assumes a fairly steady value.

(6) Previous swelling in alkali reduces the clinging power and also renders it less variable.

(7) The clinging power increases significantly when the wax is removed from the fibre. It is highly probable that this increase in clinging power is the action of freshly revealed surface corrugations which were previously hidden under wax deposits.

"Mildew attack in Grey cloth and its possible remedies with special reference to a sample supplied by a mill".—Mill industries in India and other tropical countries can easily avoid huge losses due to the attack of mildew spots on their finished goods provided they have proper chemical control over their sizing, finishing and storing departments. The tropical temperature and high humidity particularly prevailing in some of the mill centres in India, are potent factors for the growth of micro-organisms causing mildew spots on fabrics, if sufficient food material is available. The use of antiseptic is a very important factor in the sizing processes. The amount of antiseptic required should be decided by analysing the commercial samples.

No less important is the water which is used in the mixing of sizing and finishing materials. Such water must be very pure and free from all solid matter, putrifiable substances and other bacterial and fungal contaminations. In the event, however, through some fault or other, of mildew spots actually appearing on the finished goods, it is desirable that the mill concerned should immediately transfer the goods to a dry and ventilated warehouse till they arrange to desize the goods followed by treatments of bleaching and finishing. Such precautions and treatments will not only save the mill from a huge loss, but may possibly give a better monetary return.

V. GENERAL.

Visitors.—During the period under review a large number of scientists and students and persons connected with the cotton trade or textile industry visited the Laboratory. Special mention must be made of the members of the Overseas Delegation of Scientists who came out to India last cold weather to participate in the Jubilee Session of the Indian Science Congress held at Calcutta in January 1938. Among the important group of visitors were the members of the Council of Industrial Research Bureau who visited the Laboratory on 5th July 1937. Among the individual visitors mention must be made of Dr. J. Tothill, Director of Agriculture, Uganda Protectorate, who visited the Laboratory on the 31st January 1938. The following batch of students also visited the Laboratory on the dates mentioned against their names :—

(1) 18 students of the University College of Science, Calcutta, on the 28th October 1937.

(2) 46 students of the Agricultural College, Poona, on the 9th November 1937.

(3) A batch of students of the Textile Institute, Cawnpore, on the 23rd December 1937.

(4) 29 students of the Agricultural Institute, Baroda, on the 7th February 1938.

The Technological Assistants working in the mofussil laboratories attended the Laboratory in November and December 1937 for the Refresher course and the Conference of Technological Assistants. This Conference took place on the 3rd and 4th December 1937 in the Laboratory, and the subjects, which had previously been sent up by the Technological Assistants, were fully thrashed out in the discussion.

In accordance with a decision of the Indian Central Cotton Committee the First Conference between the practical Carders and Spinners and the senior staff of the Laboratory took place on the 30th September 1937. I am glad to report that a large percentage of the practical Carders and Spinners

selected by the Millowners' Association, Bombay, for this purpose attended this Conference and took part in the discussion.

An important decision arrived at by the Indian Central Cotton Committee during the period under review related to the establishment of a commercial Testing House at the Laboratory. Necessary funds were sanctioned for this purpose and during the period under review the following machines and instruments were purchased and erected in the Laboratory :—

(1) Goodbrand's Cloth Testing Machine

(2) Goodbrand's Cloth Wear Testing Machine.

(3) Goodbrand's Dye Fastness Testing Machine.

(4) Goodbrands Porosity Testing Machine.

The equipment for this Testing House is not yet complete, though it is sufficient for a beginning to be made in this direction.

Arising out of the proposals of Messrs. Courtaulds Ltd., which were received through the Bombay Millowners' Association, the Indian Central Cotton Committee at their meeting held on the 26th January 1938 agreed that the Technological Laboratory may act as the official Testing House for the B. I. S. F. A. for tests on artificial silk yarns. For these tests an additional charge of 50 per cent. is to be levied over the fees mentioned on pages 13-14.

The Standing Finance Sub-Committee at its meeting held on 23rd April 1937 decided that occasionally members of the staff of cotton mills, requiring training in special subjects, may be admitted to the Laboratory for short periods. By virtue of this decision 3 members of the staff of three local mills were admitted to the Laboratory for short periods and given the training required by them.

Equipment.—During the period under review the following apparatus and machines were added to the equipment of the Laboratory :—

(1) Knowle's Yarn Balance.

(2) B. & L. Microscope.

(3) B. & L. Comparison Eyepiece.

(4) L. & N. Potentiometers.

(5) Hartman & Brauns Volt-ammeter.

(6) Carrier's Portable Air Conditioning Plant.

Card No. 1 in the Spinning Laboratory was completely re-clothed during the period under review.

Staff.—Full details of the technical staff of the Laboratory are given on pages 40-41, while any leave and other arrangements relating to the staff are mentioned below :—

The writer proceeded on short leave from the 9th May 1938 to 11th June 1938 and during this period Mr. D. L. Sen, Senior Research Assistant, officiated as Director.

Dr. K. R. Sen, Junior Research Assistant, was on leave from the 12th November to 30th December 1937, both days inclusive. On being appointed to the post of Senior Physicist in the newly established Research Laboratories of the Indian Central Jute Committee, he relinquished his post at the Laboratory with effect from the 6th May 1938.

Mr. R. S. Koshal, Senior Research Assistant, went on leave on private affairs from the 3rd January 1938 to 22nd January 1938 and on medical certificate from 1st March to 31st March 1938. The services of Mr. Koshal were placed at the disposal of the Director of Agriculture, Punjab, for about 3 months in connection with the work of revision of standard yields. He was relieved for this work on the afternoon of 14th April 1938.

Dr. Lavji Thoria, Temporary Chemist, who was transferred to the Industrial Research Bureau, returned to the Laboratory on the 18th August 1937. After completing his work on the alpha-cellulose and ash content of linters and fuzz, wastes, rags, etc., his services were again transferred to Delhi and he was relieved on the 21st May 1938.

Mr. U. K. Benegal, Junior Tester, left the Laboratory on 7th September 1937 on 6 months' leave preparatory to resignation, in order to prosecute higher studies in England. His post was permanently filled by Mr. B. N. Prabhakar, officiating Junior Tester. On the confirmation of Mr. Prabhakar to the permanent post, one post of Junior Tester fell vacant, which was filled up by the appointment of Mr. K. Birch, B. A., who joined his duties on the 4th May 1938.

Mr. G. Rama Rao, Research Scholar, resigned with effect from the 20th January 1938.

The term of Mr. M. U. Parmar, Research Scholar, which expired on the 16th January 1938, was extended for a period of six months.

The post of a temporary Fitter in connection with the work on ginning problems was filled up by Fitter Dahiya Goshai, who had temporarily held this post in the beginning of last year. During the period under review he worked in the Laboratory from 6th December 1937 to 5th May 1938.

Mr. R. G. Sankalia was selected for training in the elements of cotton technology and yarn testing. He joined the Laboratory on the 10th January 1938.

Mr. V. Venkataraman, Statistician and Personal Assistant, was on leave from the 28th June to 14th August 1937.

Exhibitions.—During the period under review the Laboratory participated in the All-India Exhibition of Arts and Industries, Punjab, held at Lahore, from the 6th December 1937 to 22nd January 1938. A large number of exhibits such as halo cards, Baer sorter patterns, card sliver, yarn knots, etc., prepared from eighteen Indian cottons, together with samples of cloth, were despatched to this Exhibition. These were also supplemented by a number of testing instruments, especially those designed at the Laboratory. Mr. S. M. Nawaz, Junior Tester, was deputed for demonstration work at the Exhibition.

ACKNOWLEDGMENTS.

I have great pleasure in acknowledging with grateful thanks the constant help given to me by the Office-bearers of the Committee who continued to take a keen interest in the affairs of the Laboratory. I must also express my thanks to Mr. Varjivandas Motilal of Messrs. Narandas Rajaram & Co. for his kindness in valuing the numerous samples and to the entire staff of the Laboratory for their loyal co-operation which made it possible for me to complete the work described in this report.

(Sd.) N. AHMAD,
Director,
Technological Laboratory.

Dated the 21st June 1938.

APPENDIX.

LIST OF SCIENTIFIC AND TECHNICAL STAFF OF THE TECHNOLOGICAL LABORATORY AS ON 31st MAY, 1938.

	Designation.	Name.	Remarks.
1.	Director	Dr. Nazir Ahmad, O.B.E., Ph.D., F. Inst. P...	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga.
2.	Senior Research Assistant (Chemist) ..	Mr. D. L. Sen, M.Sc., Tech. (Manch.), M.Sc. (Bom.), A.I.I.Sc., F.I.C.	Research Student of the Indian Institute of Science and Manchester College of Technology.
3.	Senior Research Assistant (Physicist) ..	Mr. N. Hari Rao, M.Sc. (Calcutta).	Research Scholar, Technological Laboratory, (Textile Physics).
4.	Senior Research Assistant (Physicist) ..	Mr. R. S. Koshal, M.Sc. (Punjab)	Do. do.
5.	Spinning Master	Mr. V. V. Gupte, B. Sc. Tech. (Manchester)..	——
6.	Junior Research Assistant (Microscopist)	Mr. A. N. Gulati, M.Sc. (Punjab)	Imperial Institute of Veterinary Research, Mukteswar, U. P.
7.	Statistician and Personal Assistant ..	Mr. V. Venkataraman, M.A. (Madras) ..	Statistical Assistant, Labour Office, Government of Bombay.
8.	Junior Research Assistant	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory, (Textile Physics).
9.	Senior Tester	Mr. H. B. Joshi, B.Sc.	——
10.	Senior Tester	Mr. S. S. Sukthankar, L.T.C. (V.J.T.I.) ..	——
11.	Junior Tester	Mr. G. D. Bhide, B.Sc...	——
12.	Junior Tester	Mr. K. V. N. Nayar	——
13.	Junior Tester	Mr. V. N. Modak, B.Sc.	——

LIST OF SCIENTIFIC AND TECHNICAL STAFF OF THE TECHNOLOGICAL LABORATORY AS ON 31st MAY 1938—*contd.*

	Designation.	Name.	Remarks.
14.	Junior Tester	Mr. L. V. Sundararaman, B.A.	——
15.	Junior Tester	Mr. P. S. Sambamurthi	——
16.	Junior Tester	Mr. R. G. Panvalkar, B.Sc.	——
17.	Junior Tester	Mr. G. J. Kharkar, B.Sc.	——
18.	Junior Tester	Mr. A. J. Farid	——
19.	Junior Tester	Mr. P. V. Nachane, B.Sc.	——
20.	Junior Tester	Mr. S. Samson, B.Sc.	——
21.	Junior Tester	Mr. C. S. Ramanathan, B.Sc.	——
22.	Junior Tester	Mr. S. N. Rao, M.Sc.	——
23.	Junior Tester	Mr. B. N. Prabhakar, B.Sc.	——
24.	Junior Tester	Mr. S. M. Nawaz, B.Sc.	——
25.	Junior Tester	Mr. K. Birch, B.A.	——
26.	Statistical Clerk	Mr. R. Krishna Iyer	——
27.	Statistical Clerk	Mr. P. K. Wagle	——
28.	Electrician	Mr. H. Lobo, L. E. E. (V.J.T.I.)	——
29.	Spinning Assistant	Mr. N. Iyengar	——
30.	Draughtsman	Mr. B. G. Mehta	——
31.	Mechanic	Mr. J. B. Kharas	——

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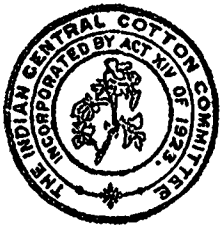

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INDIAN CENTRAL COTTON COMMITTEE

ANNUAL REPORT

OF THE

DIRECTOR

TECHNOLOGICAL LABORATORY

FOR THE

YEAR ENDING 31st MAY 1939

Annual Report of the Director, Technological Laboratory, for the Year ending 31st May 1939.

THE present report contains an account of the work done at the Laboratory between 1st June 1938 and 31st May 1939. Apart from the routine tests and the research work, which have been completed, the most noteworthy feature of the year has been the steady increase in the activities of the Laboratory falling within the scope of the Testing House, which was inaugurated in 1937. As will be seen from the figures given on page 35 the number of different kinds of samples received in the Testing House has increased by 50 per cent. in about two years. An increase of this magnitude in a short time is sufficient testimony of the useful purpose which the Laboratory is serving by starting these tests and it is hoped that the cotton mills and firms will take greater and greater advantage of these testing facilities until the total number of samples tested in the Testing House is commensurate with the large volume of trade and industry in India in general and Bombay in particular. The work of the Laboratory will now be described under the following 5 heads :—

I. Spinning Laboratory.
II. Research Laboratory.
III. Moisture Testing Section.
IV. Publications.
V. General.

I. SPINNING LABORATORY.

The samples of cotton received for tests during the period under review have been classified below in Table 1, which also gives, for purposes of comparison, the corresponding figures for last year :—

TABLE 1.—*Samples received for Tests.*

	1-6-37 to 31-5-38.	1-6-38 to 31-5-39.
Agricultural Departments	281	305
Standard Cottons	22	20
Trade Tests	62	48
Fibre Tests	84	94
Yarn Tests	53	50
Cloth Tests	..	39
Dye Absorption Tests	..	2
Special Tests	42	77
Total ..	544	635

It will be seen that during the period under review 635 samples of different kinds were received for tests, registering an increase of 17 per cent. over the already large number of 544 for last year, this increase being most pronounced in the case of the agricultural samples and samples tested for special investigations. The number of samples shown against trade tests shows a small decrease because the list of these samples was revised at the meeting of the Committee held on the 19th November 1938 at Lyallpur with the result that their total number was reduced by omitting those cottons on which tests were regarded unnecessary in future.

The following Statement A gives a summary of the agricultural samples which were spun during the period under review together with the names of the suppliers of these samples. This statement refers only to the agricultural samples, the details of samples of standard Indian cottons will be found on page 9, while details of the samples supplied by the East India Cotton Association, Ltd., and the Millowners' Associations of Bombay and Ahmedabad are given on page 11.

STATEMENT A.

BOMBAY.

(1) *The Cotton Breeder, Surat.*—13 samples of 1027 A.L.F. and selections.

(2) *The Cotton Breeder, Broach.*—27 samples of B.D. 8 and crosses.

(3) *The Cotton Breeder, Viramgam.*—6 samples of Local Wagad and selections.

(4) *The Cotton Breeder, S.M.C., Dharwar.*—16 samples of Jayawant, Gadag and Cambodia and crosses.

(5) *The Cotton Breeder, Jalgaon.*—11 samples of Jarilla and Banilla Cottons.

(6) *The Inspector of Agriculture, Dhulia.*—4 samples of 1027 A.L.F.

(7) *The Agricultural Sub-Overseer, Vaghali.*—One sample of Jarilla cotton.

SIND.

(1) *The Botanist in Sind, Sakrand.*—9 samples of Sind Sudhar, Boss III and other hybrids.

(2) *The Cotton Breeder, Government Seed Farm, Mirpurkhas.*—12 samples of Sind Sudhar, 4F-98 and other selections.

PUNJAB.

(1) *The Cotton Research Botanist, Lyallpur.*—57 samples of selections and mixtures of 4F and D.C. 6.

UNITED PROVINCES.

(1) *The Economic Botanist to Government, U.P., Cawnpore.*—36 samples of C. 402, C. 520, Perso-American and other selections.

MADRAS.

(1) *The Cotton Specialist, Coimbatore.*—15 samples of Cambodia and Uganda crosses.

(2) *The Superintendent, Agricultural Research Station, Koilpatti.*—2 samples of strains.

(3) *The Superintendent, Dry Farming Station, Bellary.*—5 samples of H. 1 cotton.

(4) *The Cotton Assistant, Mungari Cotton Scheme, Adoni.*—3 samples of Local and other selections.

(5) *The Farm Manager, Nandyal.*—One sample of Cambodia cotton.

(6) *The Senior Cotton Assistant, Agricultural Research Station, Guntur.*—9 samples of Local and other strains.

(7) *The Assistant to Cotton Specialist, Srivilliputhur.*—7 samples of crosses.

CENTRAL PROVINCES.

(1) *The Superintendent, Government Farm, Akola.*—7 samples of V. 434 and other selections.

(2) *The Agricultural Assistant, Burhanpur.*—2 samples of Buri cotton.

MISCELLANEOUS.

(1) *The Director, Institute of Plant Industry, Indore.*—36 samples of selections of Malvi, Dhar-Cambodia, and Upland cottons.

(2) *The Cotton Research Botanist, Parbhani.*—26 samples of Gaorani and other selections.

(3) *The Superintendent, Government East Farm, Sangareddy.*—5 samples of Gaorani selections.

(4) *The Superintendent, Government Main Farm, Raichur.*—17 samples of selections.

(5) *The Inspector, Cottonseed Distribution, Kopbal.*—2 samples of Jayawant cotton.

(6) *The Agricultural Inspector, Kalol, Baroda State.*—1 sample of Broach 9.

(7) *The Economic Botanist, Government Research Station, Baroda.*—2 samples of selections.

(8) *The Superintendent, Agricultural Experimental Station, Jagudan.*- 4 samples of Segregates and Local Wagad.

(9) *The Assistant Director of Agriculture, Chitaldroog, Mysore State.* 3 samples of strains.

(10) *The Director of Agriculture, Bhopal State, Bhopal.*—2 samples of Malvi and Indore selections.

(11) *The Second Economic Botanist to the Government of Bengal, Dacca.*—6 samples of *289F*.

The following tables II and III give the distribution of samples and counts spun at the Laboratory during the period under review together with the corresponding figures for the previous years :—

TABLE II.—*Distribution of Samples Spun*, 1924-39.

PROVINCE.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.
Bombay	18	26	22	22	28	66	89	69	143	111	97	59	67	44	78
Sind	..	..	..	..	..	..	..	..	..	..	..	28	47	..	21
Punjab	14	1	..	..	42	30	10	44	55	42	23	71	9	45	57
U. P.	7	..	6	11	9	7	16	7	12	6	7	11	..	2	36
Madras	2	19	50	23	30	51	66	15	28	101	30	51	31	31	42
C. P.	2	..	3	2	2	5	3	3	5	9	9	10	15	9	9
Miscellaneous ..	3	11	..	6	6	27	28	33	75	97	85	100	85	97	104
Total ..	46	57	81	64	117	186	212	171	318	366	251	330	254	228	347
Standard Cotton Tests	8	54	49	64	33	34	27	18	18	16	18	23	15	21	21
Trade Tests and Special Tests ..	..	..	..	..	..	37	89	134	125	166	131	143	162	185	172
Grand Total ..	54	111	130	128	150	257	328	323	461	548	400	496	431	434	540

TABLE III.—*Distribution of Yarns Spun*, 1924-39.

PROVINCES.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.
Bombay	103	152	132	132	159	322	253	203	430	332	292	190	217	134	249
Sind	..	..	..	..	..	..	..	..	..	..	..	84	143	..	68
Punjab	106	14	..	..	254	113	31	136	165	127	72	220	28	144	168
U. P.	27	..	36	66	54	42	40	22	32	18	21	35	..	6	94
Madras	12	108	278	138	180	255	199	53	85	303	90	151	89	91	123
C. P.	8	..	18	12	12	30	12	9	15	27	29	30	45	28	26
Miscellaneous ..	3	58	..	36	27	99	100	93	227	293	250	295	261	292	299
Total ..	259	332	464	384	686	861	635	516	954	1,100	754	1,005	783	695	1,027
Standard Cotton Tests	95	514	423	447	290	223	309	136	200	180	204	162	115	156	152
Trade Tests and Special Tests ..	..	..	..	..	..	80	343	502	256	499	810	609	649	665	498
Grand Total ..	354	846	887	831	976	1,164	1,287	1,154	1,410	1,779	1,768	1,776	1,547	1,516	1,677

It will be noticed that the number of samples spun during the period under review shows a very marked increase over the number for last year. This increase is most pronounced, being as high as 52 per cent., in the case of agricultural samples, while for samples of all descriptions taken together it amounts to as much as 25 per cent. The number of yarns spun also shows an increase over the last year's figure, which naturally is again most pronounced in the case of the agricultural samples and amounts to 10 per cent. for samples of all descriptions.

In addition to these samples of cotton, the Laboratory received and tested during the period under review 50 samples of yarn, 39 samples of cloth, 36 samples of cotton for fibre tests, 8 samples for moisture tests and 2 samples of cotton for dye absorption tests.

The following Table IV gives a summary of the reports of different types issued from the Laboratory during the year under review together with the corresponding figures for the previous years :—

TABLE IV.—*Test Reports Issued*, 1924-39.

REPORTS.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.
Spinning Test ..	7	19	19	22	21	63	92	60	87	121	112	135	129	109	127
Fibre Test	1	1	5	1	7	4	7	19	30	18	19	44	52	32	35
Yarn Test	..	..	..	1	4	4	2	3	5	3	7	13	10	14	20
Cloth Test	..	..	..	..	..	..	..	..	..	..	..	..	..	..	25
Statistical Analysis.	..	..	..	..	..	..	..	..	..	..	..	..	..	3	3
Miscellaneous ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Total Reports ..	8	20	24	24	32	71	101	82	122	142	138	192	191	158	211

It will be seen that the total number of reports issued is 211, which establishes a new record and represents an increase of 34 per cent. over the last year's figure. The increase in the number of reports is shared by tests of all kinds and descriptions, though it is most pronounced in the case of yarn and cloth tests which fall within the scope of the Testing House activities of the Laboratory.

In spite of this considerable increase in the work of the Laboratory as represented both by an increase in the number of samples tested and the number of reports issued, the permanent staff of the Laboratory remained

the same as in the previous year. The following table gives the strength of the staff of the Laboratory during the year under review together with the corresponding figures for the previous years :—

TABLE V.—*Permanent Staff*, 1924-39.

	1924.	1925.	1926.	1927.	1928.	1929.	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.	1938.	1939.
Technical and Office Staff..	8	11	20	24	27	27	32	32	32	33	34	34	35	36	36	36
Research Students ..	1	3	6	4	3	2	1	1	..	..	..	..	2	2	2	1
Fumigation Chemists ..	..	..	2	4	2	2	2	2	2	2	2	2	2	2	2	2
Total ..	9	14	28	32	32	31	35	35	34	35	36	36	39	40	40	39

The tests carried out on many of the samples included in Statements A and B are of a routine nature, but some of the samples tested possess interesting features worthy of special mention. These are as follows :—

A. AGRICULTURAL SAMPLES.

(1) *Comparative tests on Gaorani 6 and Umri Bani.*—The object of these tests was to find out whether Gaorani 6 could replace Umri Bani as a Standard Indian cotton. For this purpose samples of these cottons grown in the cultivator's fields were tested, and from the results of these tests it was concluded that if considerations of yield and ginning percentage permitted, the cultivation of Gaorani 6 by the farmers in place of Umri Bani would definitely be a better paying proposition owing to the better spinning quality of the former. Therefore, if the cultivation of this cotton spreads in the Umri Bani tract, it should be included in the list of Standard Indian Cottons.

It may be mentioned here that already a further selection called " Gaorani 6E-3 " has been made from Gaorani 6, which in the first year of its trial, gave even better spinning performance than Gaorani 6.

(2) *Cottons grown on Chalka soil.*—The soil in the eastern half of Hyderabad State known as the Talingana tract is predominantly of the Chalka (granitic) type. Very little cotton is at present grown in this area. Attempts were made to grow pure strains of Hyderabad Gaorani and Bani 306 at the Government Experimental Station, Sangareddy, situated in this tract, in order to find out the suitability of some of these strains for this area. The tests on these samples showed that the particular type of soil prevailing in this tract did not have any deleterious effect upon the spinning quality of these cottons. However, as this was the first year of trial, it was recommended that these tests should be repeated in the subsequent seasons to enable us to draw definite conclusions regarding their spinning quality and suitability of cultivation.

(3) *Variety trials of Gaorani Umri and four improved strains grown in three different blocks.*—The fibre tests on these samples were carried out by the Technological Assistant, Parbhani, who furnished the results to the Laboratory. These results here were critically examined by means of analysis of variance and the conclusions drawn regarding the effect of locality and the significance of differences between varieties were communicated to the Cotton Research Botanist, Parbhani, in a Statistical Analysis Report.

(4) *Variety trials of C.*402, *C.*520 *and Perso-American.*—Similar statistical analysis was applied to the results of fibre tests carried out at the Technological Laboratory on samples of the above-mentioned cottons grown at Cawnpore and Raya in the United Provinces. The conclusions drawn regarding the suitability of each type for either place as well as the significance of differences between them were communicated in a Statistical Analysis Report to the Economic Botanist for Cotton, U.P., Cawnpore.

(5) 9 samples of C. 520 were received from the Economic Botanist for Cotton, U.P., Cawnpore. These samples were raised from the same seed in order to find out the effect of date of sowing on the fibre properties of this cotton. Beginning with the first, each sample was sown a fortnight later. The tests carried out at the Laboratory showed that though the range of variation is not large, the later sown samples are somewhat longer and finer than the earlier sown samples.

(6) *Irrigation Experiments.*—8 samples of 289F/43 grown with different schemes of irrigation were received for tests from the Cotton Research Botanist, Lyallpur. It was found that the effect of these different irrigations was quite small on mean fibre-length and mean fibre-weight per inch, but was quite noticeable on fibre-maturity. Furthermore the spinning quality of this cotton grown under different systems of irrigation did not show any large variation except in one case in which the results were comparatively poor. A detailed report on the results of these tests were sent to the Cotton Research Botanist, Lyallpur.

(7) *Tests on Mixtures.*—Mixtures containing varying proportions of P. A. 4F and D. C. 6 were prepared and supplied by the Cotton Research Botanist, Lyallpur, in order to find out the exact manner in which the spinning quality of the former is affected by admixture with the latter. These mixtures were tested and a detailed report on them was sent to the Cotton Research Botanist, Lyallpur.

(8) *Further improvements in Jubilee Cotton.*—It will be remembered that recently the cultivation of D. C. 13, now known as "Jubilee Cotton," has been extended in the Punjab. It is interesting to note that already three improved strains, known as D. C. 20, D. C. 26 and D. C. 28, are under trial, which have given much better spinning performance than Jubilee cotton.

The performance of these three types is in fact very nearly equal to that of P. A. 4F, and if their yields and ginning out-turn are satisfactory and they maintain their superior performance in the subsequent years, they would represent a considerable improvement.

(9) *Sanguineum strains in the South-Eastern Punjab.*—Certain improved types of *Desi* belonging to the Sanguineum variety have been tried in Multan. These are early maturing strains and are gaining ground in this area as the cotton raised from them is regarded as specially suitable for hand-spinning.

(10) *Rustan Marwat cotton.*—It will be remembered that certain exotic types have been tried in the last few years in the North-West Frontier Province. One of these cottons, namely, Rustan Marwat, had given very encouraging fibre test results. During the year under review a spinning test was made on this cotton and it was found to be suitable for spinning upto 38's standard warp counts. In view of its good performance it was recommended that further trials should be made on it in the ensuing years.

(11) *Cross between* 1027 *A.L.F.* and 1*A Long Boll.*—By crossing 1027 A.L.F. and 1A Long Boll, the Bombay Agricultural Department has evolved a new strain known as Segregate 8-1, which is expected to inherit the good qualities of both of its parents. During the period under review a critical study of the fibre-properties of this strain was made and a report was sent to the Director of Agriculture, Bombay Presidency, Poona.

(12) *Jarilla cotton.*—The Indian Central Cotton Committee at its meeting held on the 11th July 1938 decided that arrangements should be made for mill tests on samples of Jarilla cotton grown in different parts of Khandesh. These arrangements were accordingly made and samples of Jarilla cotton grown at 5 places were subjected to tests in two mills in Bombay.

In addition, 6 samples of this cotton taken from the cultivators' fields in different villages were supplied by the Cotton Breeder, Jalgaon. The tests carried out on these samples showed that they were somewhat more wasty than the farm samples, but were not inferior to the latter in spinning performance. It should be mentioned in this connection that the sample of Jarilla cotton grown at Taloda was found to be much superior to the others, its exceptionally good performance being in part at least due to the fineness of its staple.

(13) *Cultivation of* 1027 *A.L.F. in West Khandesh.*—Surat 1027 A.L.F. was grown in 4 different centres in Nawapur Peta which is situated in the eastern half of West Khandesh adjoining the Surat district. These four samples were tested at the Laboratory in order to find out the extent to which the quality of this cotton is affected by the different environmental factors as represented in the Khandesh tract. It was found that these samples possess very nearly

the same spinning performance as the standard Surat 1027 A.L.F. grown at Surat, but as it was the first year of their trial it was not possible to draw a definite conclusion on this point until more tests are made in the following seasons.

(14) *Uganda Crosses at Coimbatore.*—A number of crosses between Uganda U. 4/4 and Cambodia Co. 2 are being tried at Uppilipalayam in the Coimbatore Taluk in red loamy soil under well irrigated conditions. The results of these tests show that several of these strains are very promising indeed. However, as these trials have just begun, it was recommended that they should be continued in the subsequent seasons to find out which of these crosses retained their good performance and are suited for cultivation in this tract.

(15) *Comilla cotton.*—A scheme for the improvement of Comilla cotton in Bengal was recently sanctioned by the Indian Central Cotton Committee. The Director of Agriculture, Bengal, has been asked to send samples of this cotton from the 1938-39 crop which would be tested in particular for their wax content in addition to other fibre properties in order to make an objective estimate of their feel.

(16) *Dhar-Cambodia and Musakhedi Upland.*—Samples of these two cottons grown on Adhan and Barani land at Kharua and Indore were received and tested at this Laboratory. The results of these tests showed that in the case of both cottons the samples grown on Adhan land were somewhat better in spinning performance than those raised on Barani land.

(17) *Uganda cottons.*—In accordance with the decision of the Indian Central Cotton Committee spinning tests were made in the year under review on 8 samples of Uganda cottons supplied by the Senior Botanist, Bukalasa Experimental Station, P.O. Bombo, Uganda.

(18) *Persian Mekran cotton.*—Reference was made in my last Annual Report to some tests which were carried out at the suggestion of Sir Bryce Burt on a sample of Mekran cotton in view of the importation of Persian cotton into India through the Kathiawar ports. During the year under review another sample of Mekran cotton was obtained by the Secretary, Indian Central Cotton Committee, and was tested at the Laboratory. It was found that this year's sample gave a much better performance than the one tested last year.

B. Standard Indian Cottons.

The detailed results of the tests carried out on the Standard Indian cottons of the 1937-38 season were published in the form of a Technological Bulletin in August 1938. Prior to that 10 Technological Circulars had been issued on those standard cottons which were received fairly early in the season.

The following statement shows the names of the standard cottons of 1938-39 season which have already been received at the Laboratory and on which tests have either been completed or are in progress :

BOMBAY :

1. Jayawant.
2. Gadag 1 (Dharwar-American).
3. Surat 1027 A.L.F.
4. Wagad 8.

SIND :

5. Sind Sudhar (289F.1).
6. Sind N. R. (W. N. 27).

PUNJAB :

7. Punjab-American 4F.
8. Punjab-American 289 F.
9. Mollisoni.

UNITED PROVINCES :

10. Aligarh A. 19.

CENTRAL PROVINCES :

11. (*a*) Verum 262 (Nagpur).
    (*b*) Verum 262 (Akola).
12. V. 434 (Akola).
13. Late Verum (Nagpur).

HYDERABAD :

14. Umri Bani.

MADRAS :

15. Cambodia Co. 2 (Cambodia 440).
16. Nandyal 14 (Northerns).
17. Hagari 1 (Westerns).
18. Karunganni C. 7.
19. Koilpatti (K. 1).

It should be noted in this connection that all the cottons included in the last year's list were received this year for tests excepting C. 402 for which a sample was not supplied by the U. P. Agricultural Department.

From among these cottons 8 Technological Circulars were issued during the period under review on the following cottons which were received fairly early in the season :

1. Verum 262 (Nagpur).
2. Late Verum (Nagpur).
3. V. 434 (Akola).
4. Verum 262 (Akola).
5. Sind-Sudhar.
6. Umri Bani.
7. Cambodia Co.2.
8. Surat 1027 A.L.F.

Tests on the remaining standard cottons are in progress, and when all the results are available, these, as usual, will be embodied as early as possible in the Technological Reports on Standard Indian Cottons, 1939.

C. Trade Samples and Samples from Cotton Mills.—

The samples tested under this head fall into three classes : (1) samples received by arrangement with the East India Cotton Association, (2) samples received from the various mills by arrangement with the Bombay and Ahmedabad Millowners' Associations, and (3) samples received from mills and firms to be tested on payment of certain fees.

As regards samples falling under (1) and (2) above, it was found that the list of such samples which was prepared some 10 years back required re-consideration in view of the fact that during this period some new varieties have been propagated on a large scale while some of the older varieties have lost ground in relative importance. Accordingly, the Indian Central Cotton Committee at its meeting held at Lyallpur on the 19th November 1938 gave full consideration to this matter and amended the list. The new lists as amended, is given below :

1. *List of samples to be supplied by the East India Cotton Association Ltd., Bombay.*

1. C. P. No. 1
2. Verum 434
3. Berar
4. Khandesh
5. Gaorani 6
6. Latur
7. Punjab-American 4F
8. Punjab-American 289F
9. Broach.
10. Jagadia Farm
11. Navsari
12. Kadi Viramgam
13. Farm Westerns
14. Jayawant
15. Upland (Gadag)
16. Bijapore

17. Tinnevelly
18. Cambodias
19. Karungannis
20. A. R. Kampala
21. A. R. Busoga
22. A. R. Jinja
23. L. S. S.
24. N. T. 289F/43.
25. N. T. 289F/K. 25.
26. Sind Sudhar.

2. *List of samples to be supplied through the Bombay Millowners' Association.*

1. Farm Westerns
2. Bailhongal
3. Broach
4. Karunganni
5. Ujjain (Ujjain)
6. Westerns
7. Miraj
8. Surat
9. Navsari
10. Tirupur Cambodia
11. Hubli Compta
12. Hubli Upland

3. *List of samples to be supplied through the Ahmedabad Millowners' Association.*

1. Jagadia
2. Kadi
3. Bawla

In accordance with this decision of the Committee, the East India Cotton Association and the Bombay and Ahmedabad mills were requested to supply samples in conformity with the new list. Of these, tests were completed on the following samples of trade varieties, which were received at the Laboratory during the period under review: A list of the Technological Circulars issued on them will be found under "Publications":

Samples supplied by the East India Cotton Association.

1. Berar
2. Punjab-American 4F
3. C. P. No. 1
4. Khandesh
5. Punjab-American 289F
6. Broach
7. Navsari
8. Sind Sudhar
9. L. S. S.
10. Jagadia

Samples supplied through the Millowners' Association, Bombay.

1. Ujjain
2. Broach
3. Farm Westerns
4. Surat
5. Navşari
6. Miraj
7. Hubli Upland
8. Hubli Kumpta
9. Tirupur Cambodia
10. Bailhongal

Samples supplied through the Ahmedabad Millowners' Association, Ahmedabad.

1. Rajpipla
2. Kadi

The remaining samples are expected in the near future and as soon as they are received and tested, technological circulars will be issued on them, while at the end of the season all the results will be compiled in the Technological Reports on the Trade Varieties of Indian Cottons, 1939.

The third class of samples received under this head are those sent by the mills and firms to be tested at the Laboratory on payment of certain fees laid down by the Indian Central Cotton Committee from time to time. During the period under review 11 samples were received under this head for spinning tests, 49 samples for yarn tests, 39 samples for cloth tests, 8 samples for moisture tests, 36 samples for fibre tests and 2 samples for dye absorption tests. Thus, the total number of samples received under this head is 145 as against 118 during the last year, showing an increase of 23%. It may be stated in this connection that year before last the total number of samples tested under this head was 96. Thus, during the short space of two years in which the Testing House work of the Laboratory has seriously been taken in hand, there has been an increase of 50% in the number of samples. This increase is quite satisfactory so far as it goes, but the total number is still small. It is to be hoped that the cotton mills and firms will take a much greater advantage of the facilities offered by the Laboratory in the testing of their samples and that the total number of samples tested each year will be commensurate with the large volume of cotton trade and industry in India.

Many of these tests are of a routine nature such as the determination of tensile strength of cloth or yarn, determination of actual counts, number of turns per inch, reed and pick, etc., but a few deserve special mention either owing to some special features possessed by them or as an indication of the type of work which can be done at the Laboratory. These are as follows :—

(1) Three samples of 6-ply and doubling yarns were received from a local mill to find out whether these were made from pure cotton or a mixture of cotton with some other textile fibre and also to ascertain the number of turns per inch in the single as well as the double yarns. The number of turns per inch was determined in each case and it was found that, in all cases, the yarns had been manufactured from pure cotton and were kier boiled, bleached and finally mercerised in a hank mercerising machine.

(2) A sample of bleached yarn discoloured by brown stains was received from a firm to find out the cause of these stains and the ways and means of removing them, if possible. The necessary tests were carried out, and it was found that the stains were due to the yarns having come in contact with rusty iron either in the kier or in the packing cases and that these stains could be removed effectively by a simple chemical treatment. The firm was so impressed with the sample of treated yarns sent to them that they requested

the Laboratory to treat the whole bulk amounting to 1,000 lbs. on payment of any fees asked by the Laboratory. In view of the fact, however, that the necessary equipment for treating such a large quantity of yarn was not available, it was not possible to comply with the request of the firm.

(3) A sample of bleached long-cloth with its border badly tendered and discoloured was received in order to find out the cause of this damage. It was found that the damage was due to the cloth having come in contact with hydrochloric acid and a report to that effect was sent to the mill concerned so that it may trace the source of the trouble and take the necessary steps to eliminate it.

(4) A sample of cloth in which certain insects of a boring type had made holes was received from a mill. The insects were identified as belonging to the two species of wood-boring beetle namely *Bostrychus* and *Colüdae*. Furthermore, a formula for a varnish, which is alleged to protect the wood from the attack of such beetles, was supplied to the mill together with suggestions for storing the cloth in such a manner as to obviate or greatly reduce the risk of such damage in the future. As it was felt that the subject matter of this investigation would be useful to the textile industry in general, an account of it was published, with the permission of the mill concerned, in the September 1938 issue of the *Indian Textile Journal*.

(5) Two samples of cotton were received from a Hosiery Factory with a request that they may be spun into suitable counts with different degrees of twist to find out the optimum twist required for spinning hosiery yarns. These tests were made at the Laboratory and a detailed report was sent to the Factory.

(6) Some samples of cotine were received from the Secretary, Indian Central Cotton Committee, Bombay, to find out how far this material could compete with some of the Indian cottons. The necessary tests were made and it was found that cotine has a higher fibre-strength than the strongest Indian cotton, it is very uniform in diameter and it possesses neither a central canal nor any convolutions. In whiteness it resembles Verum 262, but is as coarse as the coarsest cotton among the Indian varieties. It was, therefore, concluded that it could be spun either pure or mixed with cotton or other textile fibres, but that due to its coarseness and absence of convolutions it would probably be found suitable, at the present stage of its development, for spinning only coarse or medium counts.

(7) In connection with the investigation on the absorption of dyes by Indian cottons, a colorimeter employing the use of photo-electric cells has been designed at the Laboratory. During the period under review a mill sent two samples of cotton in order to find out their absorption for direct dyes. These tests were done with the help of this new colorimeter. Measurements of this type are important to the mills because the dyes being relatively more expensive, the mills can effect a certain amount of saving by using cottons which, other factors being equal, absorb smaller percentage of a given dye.

It may also be stated that a brief note on this instrument was published in the Industrial and News Edition of the Journal of Indian Chemical Society, 1938.

Mention has been made above to certain fees which have to be paid, for tests of different kinds, by cotton mills and firms who wish to avail of the facilities offered by the Laboratory. The following is the up-to-date list of these tests as approved by the Committee together with the fees charged for them :—

LIST OF TESTS WHICH MAY BE CARRIED OUT AT THE TESTING HOUSE.

Raw Cotton Tests.

		Rs.	a.	
1.	Percentage of moisture in cotton—			
	(*a*) 1st sample	5	0	
	(*b*) Each additional sample upto a maximum of four, provided it is sent at the same time	2	8	
2.	Percentage of waste in raw cotton (Shirley Analyser Tests)	5	0	
3.	Mean Fibre length	5	0	
3a.	Fibre length irregularity	1	0	per sample extra.
4.	Fibre weight per inch	5	0	
5.	Fibre width determination	5	0	
6.	Fibre strength	7	8	
7.	Fibre maturity	7	8	
8.	Wax content	7	8	for the first sample.
		5	0	for each additional sample provided it is sent at the same time.
9.	Dye Absorption of Cotton	5	0	
10.	Examination for mechanical injury to fibre ..	10	0	
11.	Ginning percentage of kapas	10	0	
12.	Blow room test	10	0	

Spinning Tests (Includes Yarn Tests).

		Rs.	a.	
13.	Spinning test on carded cotton	35	0	
14.	Spinning test on combed cotton	45	0	
15.	Spinning test on carded or combed cotton using high draft system in addition to the ord. three-roller system	10	0	per system extra.
16.	Spinning test, after combing, on sliver supplied by a mill	25	0	

Yarn Tests.

		Rs.	a.	
1.	Percentage of moisture—			
	(*a*) 1st sample	5	0	
	(*b*) Each additional sample upto a maximum of four, provided it is sent at the same time..	2	8	
2.	Count of yarn including count of hosiery yarn..	2	8	
3.	Strength of yarn, *e.g.*, lea test, single thread test or ballistic test	5	0	per test.
4.	Turns per inch—			
	(*a*) Single yarn	5	0	
	(*b*) Double yarn :—			
	(*i*) Double twists only	2	8	
	(*ii*) Single twist..	7	8	per yarn extra.
	(*c*) Three ply, four ply, etc., yarn ..	Charges to be reckoned as above.		
5.	Varieties of cotton composing yarn (broad classification)	25	0	
6.	Percentage of cotton and other materials in mixed yarn	10	0	to Rs. 25 depending upon the work involved.

		Rs.	a.	
7.	Evenness of yarn	2	8	
8.	Hank length	2	8	
9.	General report on yarn for neppiness, colour, amount of stains, cleanliness, etc., etc. ..	5	0	
10.	Percentage of size in warp yarns	5	0	
11.	Percentage of mature fibres in yarn	10	0	
12.	Elasticity and/or single thread strength of yarn	5	0	
	Tests on Cloth.			
1.	Dimensional tests-width, length, thickness and weight per square yard or any one of these properties	4	0	
2.	Reed and pick	3	8	
3.	Count of warp and weft	3	8	per test.
4.	Strength of warp and weft yarns taken out from cloth	6	8	per test.
5.	Contraction in weaving	2	8	
6.	Percentage of moisture—			
	(*a*) 1st sample	5	0	
	(*b*) Each additional sample upto a maximum of four, provided it is sent at the same time	2	8	
7.	Whiteness of bleached cloth	5	0	
8.	Percentage of cotton and other materials in union fabrics	10	0	
9.	Test for strength of cloth	5	0	
10.	Wearing capacity test	5	0	
11.	Full comparative reports of two samples of cloth	20	0	per sample.
12.	Water-proof test	5	0	
13.	Fastness of dyes to rubbing	5	0	
14.	Shrinkage	10	0	

		Rs.	a.
15.	Tests for analysis of Union material.		
	(*a*) *Yarn.*		
	(*i*) Not more than two component fibres..	5	0
	(*ii*) More than two component fibres ..	7	8
	(*b*) *Fabric.*		
	(*i*) Not more than two component fibres	10	0
	(*ii*) More than two component fibres ..	12	8

N.B.—(*i*) A surcharge of 25% will be levied on foreign cottons.

(*ii*) A surcharge of 50% will be levied on artificial silk yarns.

CHEMICAL AND/OR MICROSCOPIC TESTS ON COTTON, YARN OR CLOTH TO ASCERTAIN :

		Rs.	a.	
1.	Percentage of size	5	0	
2.	Percentage of China-clay and other weighting materials	5	0	
3.	Cause of tenderness	15	0	
4.	Cause of stains	20	0	
5.	Presence of mildew in cloth	5	0	
6.	Cause of mildew growth	20	0	to Rs. 30 per sample depending upon the work.
7.	Fastness of dyes	7	8	
8.	Class of dyes used	10	0	
9.	Percentage of grease	10	0	
10.	Percentage of free acid	10	0	
11.	Fastness of dyes to washing	10	0	
12.	Fastness of dyes to kier-boiling	10	0	
13.	Fastness of dyes to peroxide or chlorine bleaching	10	0	
14.	Efficiency of a wetting reagent	25	0	
15.	Efficiency of a textile auxiliary to disperse calcium soaps	25	0	

D. Technological Tests.

(1) *Combing of good-quality Indian cottons.*—It will be remembered that in my last Interim Report mention was made of the study of the effect of light and medium combing on the spinning performance of good-quality Indian cottons. The object of these tests was to find out the extent to which the improvement in the spinning performance was brought about by regular orientation and parallelisation of fibres as distinct from the improvement brought about by any small increase in the mean fibre-length which might occur in the combing process. During the year under review these tests were completed and the results obtained were published in the Technological Bulletin, Series A, No. 44, a summary of which will be found under " Publications."

(2) *Effect of different speeds in the draw frame on the quality of yarns.*—At the first Conference of the practical carders and spinners and the senior staff of the Laboratory, it was suggested that it would be useful to the industry if the Laboratory undertook an investigation on the effect of employing different speeds in the draw-frame on the spinning behaviour and the yarn quality of Indian cottons. Accordingly, an investigation along these lines was undertaken, and completed during the period under review. The results of this investigation have been published in the Technological Bulletin, Series A, No. 47, a summary of which will be found under " Publications."

(3) *Clinging Power and Yarn Strength Irregularity.*—An investigation has recently been completed with a view to correlating the fibre-properties of Indian cottons with the spinning quality of mixtures made from them. In the course of this investigation it was noticed that the yarn-strength irregularity percentage was influenced to some extent by the clinging power of the fibres. Accordingly, some more tests were carried out in order to confirm the results already obtained and to draw more definite conclusions. The results of these tests were reported in a short paper which was published in the March 1939 issue of the Indian Textile Journal. A summary of this paper will be found under " Publications."

(4) *Effect of fibre-weight on spinning quality of Indian cottons.*—As is now known from the work of the Laboratory the spinning quality of Indian cottons depends in the first place upon the mean fibre-length and, in the second, upon the mean fibre-weight per inch. While going through the annual report for 1936-37 of the Technological Assistant, Dharwar, the writer came across the results for a number of co-related strains which showed remarkable constancy in their mean fibre-length but considerable variation in fibre-weight per inch. As it was felt that spinning tests on such strains would throw light on the influence of fibre-weight per inch on the spinning quality of co-related cottons, the Cotton Breeder was requested to grow them in quantities sufficient for spinning tests in the following season. These samples were received and tested at the Laboratory and a short article on the results of these tests was published in the April 1939 issue of the Indian Textile Journal. A summary of this article will be found under " Publications."

(5) *Empirical Relationships between Count, Lea-Strength, and Staple Length of Indian cottons.*—The practical spinners are often confronted with the problem of predicting the test of a cotton for a specified count from the known results of a count into which it has actually been spun. With the help of the data available at the Laboratory this problem was successfully tackled and a formula connecting the two above-mentioned factors was evolved. Similarly, practical spinners often want to know the suitability of a particular type of cotton of known staple length for spinning into yarns possessing adequate strength. This question was also examined in the light of the data available for standard Indian cottons and other samples tested at the Laboratory and a formula connecting the staple length and the count for which a cotton is suitable was evolved. An account of these two investigations was published in the Technological Bulletin, Series A, No. 42, a summary of which was given in my last Annual Report. The publications of the Laboratory are often reviewed fairly extensively in the English and continental journals. In the case of this particular bulletin, it is gratifying to note that it was reproduced almost *in toto* by the Melliand Textil-berichte in its March and April 1939 issues, showing clearly the importance attached by the journal to the subject-matter of this bulletin.

(6) *Quality of lint in relation to ginning factors.*—This investigation has been undertaken in order to study, in a comprehensive manner, the effect of employing different speeds, settings, nature of roller material, etc., on the fibre-properties, spinning performance, ginning outturn, rate of production, power consumption, etc., of Indian cottons covering a wide range of staple length. During the period under review the experimental part of the investigation has been completed and the analysis of the large mass of data is now being done. When this analysis is completed, the results obtained will be published in the form of a Technological Bulletin.

(7) *Deterioration of B. D.8 cotton with lapse of time.*—This investigation arose out of an earlier investigation carried out with the object of studying the deterioration of Broach cotton with time. During the period under review a paper describing the results obtained so far was prepared and read before the Indian Science Congress at its session held in Lahore in January 1939. A summary of this publication will be found under " Publications."

(8) *Effects of storage on the quality of Indian cottons.*—This investigation was started in May 1938 in accordance with the decision of the Indian Central Cotton Committee in order to find out the extent to which colour, appearance and the spinning quality of six important types of Indian cotton change when stored for two years under conditions normally prevailing in Bombay. The first set of samples, for these tests, were drawn in May 1938. During the period under review two further sets of samples have been drawn from the stored bales. The tests on the second set have already been completed, while those on the third set are now in progress. In addition to strength and

measurement of lustre of each cotton, tests have also been made on its copper number in order to study the degree of oxidation which may take place during storage.

(9) *Tests on mixtures of staple fibre and cotton.*—The staple fibre is steadily gaining ground as a raw material which may be mixed with cotton and spun on cotton spinning machinery. Some time back an investigation was completed at the Laboratory in which a preliminary study was made of the spinning quality of mixtures with some Indian cottons of three types of staple fibres. In view of the growing importance of this subject it was felt that the scope of this investigation should be enlarged by using staple fibre covering a wider range of length and filament denier and also by studying the optimum conditions for the treatment of such mixtures. An investigation designed on the above-mentioned lines was accordingly undertaken, the cottons selected for the purpose being Cambodia Co.2, Jayawant and Surat 1027, A.L.F. This investigation is in progress.

(10) *Different treatments in the blow-room.*—The proper treatments for different cottons possessing different amounts of trash is a matter of very great practical importance to the mills, as the appearance and quality of yarns spun from a cotton depends to a considerable extent on the correctness or otherwise of this treatment. The Indian Central Cotton Committee accordingly decided that this problem should be investigated in a thorough manner. Accordingly, tests employing different number and speeds of crighton opener have been completed during the period under review on Bengals cotton, while similar tests are now in progress on P. A. 289F. These tests will be extended to a few more Indian cottons, and after studying the effect of number and speed of the crighton opener similar tests will be undertaken with respect to the scutcher.

(11) *Comparison of mill and Laboratory tests.*—Owing to certain conditions peculiar to a Technological Laboratory which are related to the size of the sample, the individual attention in the different machines, etc., the tests carried out in the Laboratory generally give somewhat higher results than those obtained in a mill. This statement applies not only to the Technological Laboratory but also other similar institutions elsewhere in the world. In order that the mills may utilise fully the results of tests carried out at the Laboratory, it is necessary to have a fairly correct estimate of the average difference that may be expected between the Laboratory tests and the mill tests. Accordingly, an investigation has been undertaken in order to assess the magnitude of this difference. For this purpose one bale each of Broach, Jayawant, P. A. 289F and Oomra was purchased and 110 lbs. from each bale was supplied to each of the three local mills, while spinning tests were made at the Laboratory on representative samples from the balance of the material. The mills have furthermore been requested to send small samples from various stages in the processing of the cottons so that the point at which the differences

between the Laboratory tests and the mill tests originate may also be ascertained. These tests are in progress, and when they are completed a report on them will be furnished.

II. RESEARCH LABORATORY.

Physics Section.

Fibre Testing Section.—This section was kept fully occupied with carrying out fibre tests, of different kinds, on large size and small size samples received at the Laboratory. In addition to samples received for full tests, of which an account has already been given, fibre tests were made on 126 small size samples. Thus, the total number of samples tested for various fibre-properties in this section during the year amounted to 548. Statement B gives the distribution of the small size samples on which only fibre tests were made during the year :

Statement B.

1. *The East India Cotton Association, Ltd., Bombay.*—8 samples of African cotton.
2. *A Mill, Bombay.*—8 samples of Egyptian cotton.
3. *A Mill, Bombay.*—6 samples of silk.
4. *A Firm, Bombay.*—4 samples of Surat cotton.
5. *A Firm, Bombay.*—One sample of Ankleshwar cotton.
6. *The Ceylon Trade Commissioner for India, Bombay.*—4 samples of bleached grass pulp.
7. *The Secretary, Indian Central Cotton Committee, Bombay.*—1 sample of cotine.
8. *A Mill, Ahmedabad.*—1 sample of Absorbent cotton.
9. *A Mill, Ahmedabad.*—2 samples of Egyptian cotton.
10. *The Cotton Breeder, Surat.*—9 samples of selections.
11. *The Cotton Breeder, Broach.*—14 samples of crosses.
12. *The Cotton Breeder, Jalgaon.*—5 samples of new selections.
13. *The Director, Institute of Plant Industry, Indore.*—9 samples of Bhadnavar and Dhar selections.
14. *The Economic Botanist to Government, U.P., Cawnpore.*—29 samples of selections.

15. *The Superintendent, Agricultural Research Station, Koilpatti.*—14 samples of K.1 and Co.2 strains.

16. *The Director of Agriculture, Assam.*—6 samples of Assam cottons.

17. *The Assistant Director of Agriculture, Chitaldroog.*—3 samples of strains.

18. *The Superintendent, Government Soap Factory, Bangalore.*—2 samples of silk.

Mr. Hari Rao, in addition to supervising the work of this section, continued with his investigation dealing with detailed study of the fibre-properties of such cottons as have given abnormal spinning test results. The object of this investigation is to find out, in terms of the physical properties of their fibres, the causes which are responsible for the abnormal behaviour in spinning of such cottons. For this purpose a fairly large number of cottons have been selected which have shown abnormal features in this respect and are being subjected to very detailed study of their fibre-properties. Hitherto 30 cottons have been completely tested and tests on the remaining cottons are in progress.

In addition to this work, a paper dealing with the new Dial Reading Instrument for measuring the strength of cotton fibres was written up during the year and published as a Technological Bulletin, Series B, in the Journal of the Textile Institute. A summary of this bulletin will be found under the head "Publications."

Mr. R. S. Koshal was on deputation from the 19th April 1938 to 7th September 1938 with the Punjab Government for the purpose of analysing the data obtained in the crop cutting experiments. On resuming duty at the Laboratory he continued with his investigation on the size of a satisfactory sample for the determination of the swollen diameter of cotton fibres. This investigation was completed and a bulletin describing the results obtained was published as a Technological Bulletin, Series B, in the Journal of the Textile Institute. A summary of this bulletin will be found under the head " Publications."

After completing this bulletin Mr. Koshal was entrusted with the problem of finding out the optimum treatment in the blow-room suitable for different types of Indian cottons. A reference to this investigation has already been made under the head " Spinning Laboratory," but it may be stated here that, in addition to spinning tests, the fibres of the samples to which different treatments are given in the blow-room are being examined for fibre-length, fibre-length irregularity, fibre-strength and mechanical damage. This investigation is in progress.

In addition, Mr. Koshal devoted a part of his time to completing another investigation undertaken with the object of studying in collaboration with Mr. Gulati the influence of genetical factors on the fibre-weight per unit length and its relationship with fibre-maturity. A paper on this subject has been completed and will be published in due course.

Mr. C. Nanjundayya has been entrusted with the investigation relating to the effect of storage on the grade, fibre-strength and spinning performance of some of the more important types of Indian cottons to which a reference has already been made under the head "Technological Samples." It may be stated here that samples are being drawn every six months and are being subjected immediately afterwards to spinning tests, while the intervening period is being utilised for the determination of yarn strength, fibre-strength, lustre and copper number. This investigation is in progress.

Mr. Nanjundayya spent a part of his time in training some members of the staff of the Laboratory and some of the outside people in the use of the new Stapling Apparatus and the new device for measuring the percentage distribution of fibres of different lengths in cotton.

Mr. Srinagabushana, who was formerly Technological Assistant at Surat, was appointed Junior Research Assistant at the Laboratory in place of Dr. K. R. Sen who was offered a higher post in the newly opened Research Laboratory of the Indian Central Jute Committee, Calcutta. Mr. Srinagabushana joined the Laboratory on 2nd November 1938 and was entrusted with the study of the spinning performance of mixtures prepared from good quality Indian cottons and staple fibres to which a reference has been made under the head "Technological samples." In addition to making the necessary tests on the yarns spun from these samples, Mr. Srinagabushana is making fibre tests including the determination of fibre-length, fibre-weight per unit length, fibre-strength, clinging power and fibre-width of these samples. This investigation is in progress.

CHEMISTRY SECTION.

Mr. D. L. Sen continued with his investigation on the absorption of direct dyes by 7 standard Indian cottons in the pure, kier-boiled and mercerised state. Previous work on this problem had shown that an increase in the molecular weight of the dye stuffs was accompanied by a reduction in the maximum dye absorption and that the dyes possessing heavy molecular weights showed greater variation in their absorption by Indian cottons. In order to confirm and extend these results, the absorption of two more dyes by these cottons in the pure, kier-boiled and bleached state was studied. The experimental part of this investigation has now been completed and a paper on the subject is in the course of preparation.

It has been stated elsewhere that some samples of yarn were received from a local mill in order to find out whether they were made from pure cotton or from mixtures of cotton with some other textile fibres. This work was done and a report on the samples was sent to the mill concerned, but as it was thought probable that similar inquiries regarding the composition of union yarns or fabrics would be made in the future, Mr. Sen was entrusted with the task of selecting and trying suitable methods of chemical analysis of textile fibres which may in future be used by the Laboratory whenever an occasion arose. This work was completed during the period under review.

The period under review was characterised by a considerable increase in the number of requests from cotton mills and firms for tests of a chemical nature on their samples of yarn and cloth. Most of these tests were carried out by Mr. Sen. Reference to some of them has been made under the head "Trade samples." Mention may here be made of tests for the determination of viscosity and ash content of four samples of bleached and unbleached pulp prepared from Mana grass which were sent by the Ceylon Government. It was found that these materials were suitable for the manufacture of cardboard, brown paper and white paper but not artificial silk.

Mr. M. U. Parmar continued his investigation on the effect of different treatments of kier boil and bleach on the strength, lustre and wettability of cotton yarn and its viscosity in cuprammonium solution. The four cottons selected for this purpose are 1027 A. L. F., Cambodia Co.2, P. A. 289F and Jayawant. Experiments made on the yarns spun from these cottons fall into two series. In the first series the yarns were given 7 different treatments of kier boil and 3 different treatments of bleach while in the second series one cotton (Jayawant) was given 13 different treatments of kier boil and two different treatments of bleach, while the remaining three cottons were given 5 different treatments of kier boil, each kier-boiled yarn being given two different treatments of bleach. The experimental part of this investigation has been completed during the period under review. The report on the second series is under preparation and will be submitted in due course.

On the completion of his work here, Mr. Parmar was appointed as Technological Assistant, Surat.

MICROSCOPY SECTION.

Mr. A. N. Gulati continued with his investigation on the effects of environment on the fibre-maturity of certain cottons. This investigation relating to the samples received from the Institute of Plant Industry, Indore, was completed during the period under review and a paper on the subject is in the course of preparation. It is proposed to undertake a similar investigation in the near future, as suggested at the last meeting of the Technological Research Sub-Committee, on samples of 289F and 4F raised at Lyallpur. Furthermore, Mr. Gulati completed, in collaboration with Mr. Koshal, a paper on the inheritance of fibre-maturity from parent cottons to their progenies to which a reference has been made above.

In addition to this work, Mr. Gulati continued with his investigation on the effect of storage under different conditions of relative humidity on the lustre, fibre-strength and fungal infection of B. D. 8 and Broach-Palej cottons. A large number of tests on samples stored under different conditions of humidity, created with the help of different agencies, were carried out during the period under review in order to verify some unexpected results and to elucidate certain obscure points. This investigation is in progress.

III. MOISTURE TESTING SECTION.

During the year under review tests for the determination of moisture content were made on 59 samples. The details of these tests are as follows :—

Technological samples	20
Trade samples	39

The technological samples referred to above are mostly those tested in connection with the various investigations which are being carried out at the Laboratory and to which a reference has been made in the preceding pages. The total number of samples tested in this section upto 31st May 1939 is 1,071.

IV. PUBLICATIONS.

The following Bulletins and Technological Circulars were either published or issued from the Laboratory during the period under review :—

I. *Technological Bulletins, Series A, Nos.* 44 *to* 47.

(1) Technological Bulletin, Series A, No. 44 " Further Tests on the Combing of Good-Quality Indian Cottons," by Nazir Ahmad, O.B.E., Ph.D., F. Inst. P.

(2) Technological Bulletin, Series A, No. 45 " Technological Reports on Standard Indian Cottons, 1938," by Nazir Ahmad, O.B.E., Ph.D., F. Inst. P.

(3) Technological Bulletin, Series A, No. 46 " Technological Reports on the Trade Varieties of Indian Cottons, 1938," by Nazir Ahmad, O.B.E., Ph.D., F. Inst. P.

(4) Technological Bulletin, Series A, No. 47 " The Effect of Employing different Speeds in the Draw Frame on the Quality of Yarn," by V. V. Gupte, B.Sc. (Bom.), B.Sc. (Tech.) Manch., and Nazir Ahmad, O.B.E., Ph.D., F.Inst. P.

II. *Technological Bulletins, Series B, Nos.* 26 *and* 27.

(1) Technological Bulletin, Series B, No. 26 " A Dial Reading Apparatus for the Determination of Fibre Strength " by S. S. Sukthankar, L.T.C. (Hons.), Nazir Ahmad, O.B.E., Ph.D., F. Inst. P., and H. Navkal, M.Sc.

(2) Technological Bulletin, Series B, No. 27 " The Determination of the Swollen Diameter of Cotton Fibres—Effect of Size of Sample on the Significance and Reliability of the Results," by R. S. Koshal, M.Sc., and Nazir Ahmad, O.B.E., Ph.D., F. Inst. P.

III. *Technological Circulars :*

Technological Circulars Nos. 355 to 402 inclusive as under :—

Circular. No.	Title.	Date of Publication.
355	Spinning Test Report No. 957 on samples of Surat Cotton, 1937–38	June 1938.
356	Spinnng Test Report No. 958 on samples of Muttia Cotton, 1937–38	" "
357	Spinning Test Report No. 960 on samples of Navsari Cotton, 1937–38	" "
358	Technological Report on samples of Surat 1027 A.L.F. Cotton, 1937–38	" "
359	Technological Report on samples of Jayawant Cotton, 1937–38	" "
360	Spinning Test Report No. 964 on samples of A. R. Busoga Cotton, 1937–38	" "
361	Spinning Test Report No. 965 on samples of A. R. Kampala Cotton, 1937–38	July 1938.
362	Spinning Test Report No. 966 on samples of A. R. Jinja Cotton, 1937–38	" "
363	Spinning Test Report No. 968 on samples of Dholleras Cotton, 1937–38	" "
364	Spinning Test Report No. 969 on samples of Kadi/ Viramgam Cotton, 1937–38	" "
365	Spinning Test Report No. 971 on samples of Kalagin Cotton, 1937–38	" "
366	Spinning Test Report No. 978 on samples of Westerns Cotton, 1937–38	August 1938.
367	Spinning Test Report No. 991 on samples of Jagadia Cotton, 1937–38	October 1938.
368	Spinning Test Report No. 992 on samples of Bijapur Cotton, 1937–38	" "
369	Spinning Test Report No. 993 on samples of Bagalkote Cotton, 1937–38	" "
370	Spinning Test Report No. 994 on samples of Karunganni Cotton, 1937–38	" "
371	Spinning Test Report No. 996 on samples of Tinnevelly Cotton, 1937–38	" "
372	Spinning Test Report No. 997 on samples of Kumpta Cotton, 1937–38	" "
373	Spinning Test Report No. 1023 on samples of Ujjain Cotton, 1938–39	January 1939.
374	Spinning Test Report No. 1033 on samples of Berar Cotton, 1938–39	" "
375	Spinning Test Report No. 1034 on samples of Punjab-American 4F Cotton, 1938–39	" "
376	Spinning Test Report No. 1037 on samples of C. P. No. 1 Cotton, 1938–39	February 1939.
377	Technological Report on Late Verum (Nagpur), 1938–39 ..	" "

Circular No.	Title.	Date of Publication.
378	Spinning Test Report No. 1040 on samples of Khandesh Cotton, 1938–39	February 1939.
379	Spinning Test Report No. 1041 on samples of P.A. 289F Cotton, 1938–39	,, ,,
380	Technological Report on Umri Bani, 1938–39	,, ,,
381	Technological Report on Verum (262) Nagpur 1938–39 ..	,, ,,
382	Spinning Test Report No. 1048 on samples of Broach Cotton, 1938–39	,, ,,
383	Technological Report on Verum (262) Akola, 1938–39 ..	,, ,,
384	Technological Report on V. 434 Akola, 1938–39	,, ,,
385	Spinning Test Report No. 1055 on samples of Farm Western Cotton, 1938–39	March 1939.
386	Spinning Test Report No. 1057 on samples of Surat Cotton, 1938–39	,, ,,
387	Spinning Test Report No. 1058 on samples of Navsari Cotton, 1938–39	,, ,,
388	Spinning Test Report No. 1060 on samples of Miraj Cotton, 1938–39	April 1939.
389	Spinning Test Report No. 1064 on samples of Broach Cotton, 1938–39	,, ,,
390	Spinning Test Report No. 1065 on samples of Navsari Cotton, 1938–39	,, ,,
391	Spinning Test Report No. 1066 on samples of Hubli Upland Cotton, 1938–39	,, ,,
392	Spinning Test Report No. 1068 on samples of Hubli Kumpta Cotton, 1938–39	,, ,,
393	Spinning Test Report No. 1072 on samples of Sind Sudhar Cotton, 1938–39	May 1939.
394	Spinning Test Report No. 1073 on samples of L.S.S. Cotton, 1938–39	,, ,,
395	Technological Report on Surat 1027 A.L.F. Cotton, 1938–39.	,, ,,
396	Spinning Test Report No. 1075 on samples of Tiruppur Cambodia Cotton, 1938–39	,, ,,
397	Spinning Test Report No. 1076 on samples of Bailhongal Cotton, 1938–39	,, ,,
398	Spinning Test Report No. 1078 on samples of Jagadia Cotton, 1938–39	,, ,,
399	Technological Report on Cambodia Co. 2 (Cambodia 440) 1938–39	,, ,,
400	Technological Report on Sind-Sudhar Cotton, 1938–39 ..	,, ,,
401	Spinning Test Report No. 1082 on a sample of Rajpipla Cotton, 1938–39	,, ,,
402	Spinning Test Report No. 1083 on samples of Kadi Cotton, 1938–39	,, ,,

In addition to the above, the following papers were contributed in different Journals :—

(1) "The Effect of Clinging Power of Fibres on Yarn-Strength Irregularity" by K. R. Sen, D.Sc. and Nazir Ahmad, O.B.E., Ph.D., F. Inst. P.—Published in the March 1939 issue of the *Indian Textile Journal.*

(2) "The Effect of Fibre-Weight per inch on the Spinning Quality of some Indian Cottons" by Nazir Ahmad, O.B.E., Ph.D., F. Inst. P.—Published in the April 1939 issue of the *Indian Textile Journal.*

(3) "India's Long Staple Varieties" by Nazir Ahmad, O.B.E., Ph.D., F. Inst. P.—Published in the 13th January 1939 issue of "Textile Mercury and Argus."

(4) "Damage done to Cloth by Wood-boring Beetles" by A. N. Gulati, M.Sc.—Published in the September 1938 issue of the *Indian Textile Journal.*

(5) "A Note on a Photo-electric Colorimeter for the Estimation of Dye Absorption of Indian Cottons" by Nazir Ahmad, O.B.E., Ph.D., F. Inst. P. and D. L. Sen, M. Sc. Tech. (Manch.) M.Sc. (Bom.), A.I.I.Sc., F.I.C.—Published in the Industrial and News Edition of the Journal of the Indian Chemical Society, Vol. I, 1938, Nos. 1 & 2.

In addition, the following papers were read at the Indian Science Congress held in January 1939 at Lahore :—

(1) "The Effect of Environmental and Genetical Factors on Fibre Maturity of Cotton" by A. N. Gulati, M.Sc., and Nazir Ahmad, O.B.E., Ph.D., F. Inst. P.

(2) "The Effect of Storage at Different Relative Humidities on the Strength and Colour of Cotton" by Nazir Ahmad, O.B.E., Ph.D., F. Inst. P. and A. N. Gulati, M.Sc.

(3) "A Dial Reading Apparatus for the Determination of Fibre Strength" by S. S. Sukthankar, L.T.C. (Hons.), Nazir Ahmad, O.B.E., Ph.D., F. Inst. P. and H. Navkal, M.Sc.

Furthermore, two small Brochures were issued from the Laboratory during the period under review. They are as follows :—

(1) "Inauguration of A Testing House for Cotton Trade and Industry" issued under the joint authority of the Millowners' Association, Bombay, Millowners' Association, Ahmedabad, and the Indian Central Cotton Committee (English and Gujaratee Editions).

(2) "A New Stapling Apparatus for determining the mean length, regularity and fineness of Cotton or other Textile Fibres" by Nazir Ahmad, O.B.E., Ph.D., F. Inst. P. and C. Nanjundayya, M.Sc.

The first-mentioned brochure was issued under the joint authority of the Indian Central Cotton Committee and the Millowners' Associations of Bombay and Ahmedabad. The various Millowners' Associations, Chambers of Commerce and Trade Associations were asked to state the number of copies required by them for circulation to their members and these copies were supplied to them.

The second brochure on the Stapling Apparatus was written in a simple and non-technical language and distributed to cotton mills in India.

The Textile Mercury and Argus (Manchester) had expressed a desire to publish an article on the long staple cottons developed in Sind. Accordingly, with the permission of the Committee, an article was contributed to this Journal which appeared in its issue of 13th January 1939.

Summaries of Technological Bulletins, Series A, Nos. 44 and 47, Series B, Nos. 26 and 27 and four papers are given below :—

Technological Bulletin, Series A, No. 44, "*Further Tests on the Combing of good quality Indian Cottons.*"—This bulletin contains the results of the combing tests carried out on four good quality Indian cottons, P.A. 289F, Jayawant, Surat 1027 A.L.F. and Cambodia Co. 2 with a view to studying the effects of light combing on their fibre-properties and spinning performance. Each cotton was spun into carded yarns and was also combed, on a Nasmyth Comber, with 8's, 10's and 12's nipper settings and the combed material was spun on the same ring frame into suitable counts. The comber waste obtained from each cotton with each nipper setting was mixed in the proportion of 1 : 2 with Broach (Palej) cotton and the mixtures were spun into suitable coarse counts. The resulting yarns were examined for lea-breaking strength, single thread strength, evenness class, number of neps per yard, etc. The raw cottons, the carded and the combed slivers and the comber wastes were subjected to fibre tests for the determination of mean fibre-length and fibre-length irregularity. The following conclusions are drawn from a consideration of the results obtained in these experiments.

(1) The mean fibre-length of the combed material is greater than that of the carded material and the difference between the two increases progressively as the degree of combing is raised resulting in the extraction of larger percentages of comber waste. However, in no case, the mean length of the combed material exceeded that of the raw cotton even when, with 12's nipper setting, 20—25% comber waste was extracted. This agrees very well with a previous result of the Laboratory.

(2) The fibre-length irregularity decreases, or, in other words, the regularity of the fibres in respect of length improves as the degree of combing is raised. This effect is most noticeable with P.A. 289F.

(3) The mean fibre-length of the comber wastes is much lower than that of either the raw material or the carded sliver. It shows a tendency to increase with the extraction of the higher percentages of comber waste. With a few exceptions, the fibre-length irregularity of the comber waste is about 25 per cent. and is independent either of the nipper setting employed or the cotton used in the tests.

(4) By combing these cottons to the extent of only 8%, it is possible to spin them without many breakages into finer counts, the difference in this respect (yarn breakages) between the materials combed to the extent of 8 and 12 per cent. respectively from the same cotton is not significant, but by employing a still higher degree of combing (25%) it is possible to spin the material into still finer counts and yet avoid bad spinning troubles.

The comber wastes when mixed with Broach (Palej) presented no difficulty in spinning on the ring frame in the matter of yarn breakages.

(5) Combing has the desirable effect of reducing the degree of neppiness of yarns, especially where this defect exists, to an appreciable extent, in the raw material, there is very little difference in this respect in the relative efficiency of 8% and 12% combing, while combing to the extent of 20–25% with 12's nipper setting does bring about a further improvement.

(6) Degree of neppiness of yarns spun from the mixtures of comber wastes does not bear a simple relationship to the neppiness of the original good quality cotton. Furthermore, the degree of neppiness in the yarns spun from mixture of comber wastes of these four cottons with Broach (Palej) cotton appears to be independent of the nipper setting from 8's to 12's setting.

(7) There is no appreciable difference in the degree of evenness of the yarns obtained with 8% and 12% combing, but there is a marked improvement in evenness when with 12's nipper setting, 20 to 25 per cent. comber waste is extracted. Thus, in order to spin 'even' 40's yarns or 'fairly even' 50's yarns from these cottons it would be necessary to extract at least 20–25% waste in the combing process, any lower degree of combing failing to bring about a substantial improvement over the carded yarns in respect of evenness of yarns.

(8) With these four cottons a small improvement (about 5%) in yarn-strength over the carded yarns may be achieved by extracting about 8% comber waste with 8's nipper setting. If still further improvement in yarn-strength is aimed at, it can only be effected by extracting 20—25% comber waste, the intermediate stage failing to produce any appreciable increase in yarn-strength. The improvement observed in yarn strength, etc., with 8's

nipper setting should be regarded as being mainly due to the better orientation and parallelisation of fibres, while the improvement noticed with the higher nipper settings is partly due to these factors and partly to an improvement in mean fibre-length and fibre-length regularity brought about by the extraction of the shorter fibres in relatively larger proportions. As the total improvement in yarn strength with 12's setting was of the order of 18%, the difference between the two gives a rough estimate of the relative importance of the two sets of factors. In order, however, to obtain more exact values, it would be necessary to undertake more tests of a similar nature. The values given above are the average for the different cottons, which, however, show interesting differential response to the combing treatment.

(9) While the comber wastes of Jayawant and Surat 1027 A. L. F. when mixed with Broach Palej improved the spinning performance of the latter, that of Cambodia Co.2 lowered it slightly, while the comber wastes of P. A. 289F obtained with the different nipper settings behaved in an erratic manner due to probably the presence of immature fibres in the wastes obtained from this cotton.

Technological Bulletin, Series A, No. 47, "*The Effect of employing different speeds in the Draw-frame on the Quality of Yarn.*"—Considerable difference of opinion prevails among the practical spinners as regards the optimum speeds which should be employed in the draw-frame. The demand for higher production in the ring frame has often necessitated the use of higher speeds in the preparatory machines, without the benefit of sufficient data on the effect of such speeds on the spinning behaviour of a cotton and the quality of yarns spun from it. The present investigation has, therefore, been undertaken in order to study the effects of employing different speeds in the draw-frame. For this purpose, six Indian cottons, namely P. A. 289F, Jayawant and Cambodia Co.2 representing the long staple, Wagad and Broach representing the medium staple and Raman (desi) representing the short staple, were selected. The card sliver of each cotton was collected into six cans which were used throughout in the subsequent tests. Each cotton was given two passages in the draw-frame and four different speeds of the front roller approximating to 320, 370, 425 and 475 r.p.m. were employed. The resulting sliver was spun into suitable counts and the yarns obtained were examined for their physical properties. So far as possible, the hank, draft, twist, etc., were kept the same in all machines for the different slivers prepared from each cotton, the only change in their treatment being the speed of the front roller in the draw-frame. The following conclusions are drawn from a study of the results :—

(1) *Yarn breakages.*—A distinct trend is noticeable for the breakages in the ring frame to increase as the speed of the front roller is raised from about 320 r.p.m. to about 420 r.p.m., the effect being more pronounced for the shorter than for the comparatively longer stapled cottons. As the speed is raised further to about 475 r.p.m. there is also a fall in the number of breakages. Thus, the breakages show a tendency to increase with roller speed, and the

drafting conditions associated with a speed of 475 r.p.m. cause such modifications in the orientation of the fibres in the sliver as are conducive to good spinning behaviour in the ring frame. Whether this state of affairs would continue with still higher speeds in the draw-frame and to what limit, would require further investigation.

(2) *Yarn evenness and neppiness.*—The different speeds employed in these tests have very little effect upon the degree of evenness in the yarns of the same counts spun from a cotton. The same observation applies to the degree of neppiness of the yarns.

(3) *Yarn-strength.*—Within the limits of front roller speeds used in these tests, the lea strength does not vary appreciably especially for the comparatively longer cottons, as the speed of the draw-frame front roller is increased. The increase in production with high speeds is, therefore, not offset by a loss in lea strength, especially with the longer cottons. With relatively shorter cottons a small loss in lea strength is noticeable with higher front roller speeds of the draw-frame but even with these, the highest speed employed showed a small improvement over the middle speeds. Whether this improvement would be maintained with still higher speeds and to what limit are questions which can only be answered with a further investigation.

(4) If, instead of lea strength, a quantity known as yarn quality, which takes into account the percentage extension as well as the dispersion of strength values, is considered, it is found that the best results are given by the slivers which were processed with the lowest speeds, while the poorest results are registered by the slivers which were processed by the two higher speeds. The differences in yarn quality between the lower and the higher speeds are more noticeable for the short than for the relatively long stapled cottons.

It is, however, a moot point whether the sacrifice in production would be compensated for by the improvement in yarn quality by employing the low speeds.

Technological Bulletin, Series B, No. 26, *" A dial-reading Apparatus for the Determination of Fibre-strength ".*—The paper gives an account of an apparatus designed by the authors for measuring the strength of textile fibres. A fibre is suspended from a hook fixed to a lever arrangement in which an electric is circuit completed as soon as the fibre is straightened out. The other end of the fibre is attached to a float suspended in a solution of calcium chloride contained in a U-tube. The tension on the fibre is applied by raising a counterpoise suspended from a string in the second arm of the U-tube. As this counterpoise is gradually raised the level of the liquid surrounding the float falls and the pull on the fibre increases steadily until it breaks when the float which had hitherto been held by the fibre drops in the U-tube. The counterpoise is raised by winding the string on a pulley, which is driven by a gear arrangement from a small electric motor. The same gear records the tension

applied to the fibre on two calibrated dials, in units and hundreds. The arrangement for applying and recording the tension is connected to the electric circuit referred to above and works only so long as the circuit is complete. As soon as the fibre breaks, the electric circuit is interrupted and both the pointer and the counterpoise come to rest.

The mean values obtained with this apparatus for cottons are given along with those obtained by the Magazine Hair Tester. It is found that the agreement between the two sets of values is good. In addition to being accurate, this apparatus is quick in action, while its costs of construction and maintenance are quite low.

The lower and upper quartiles, the co-efficients of variation and the values of skewness calculated for the data obtained with these two instruments are also compared.

Technological Bulletin, Series B, No. 27, " The Determination of the Swollen Diameter of Cotton fibres—Effect of Size of Sample on the Significance and Reliability of the Results."—Swollen diameter has recently come into prominence as a measurable character of the cotton fibre, on account of its relationship on the one hand with the intrinsic fineness of cotton and on the other with its spinning performance. For its accurate measurement, however, it is essential, to determine the size and reliability of a satisfactory sample, because like other properties of the cotton fibre, it shows a fairly large degree of variability. An investigation was therefore undertaken with a view to determine the number of tests which may be regarded as satisfactory for the determination of this property. The following formula has been used for this purpose :—

$$N = \frac{m^2 \sigma^2}{X^2}$$

where N is the number of tests, X is the desired accuracy expressed as percentage of the mean, σ percentage standard deviation, and m the factor for obtaining specific odds. In the present investigation a large number of cottons were tested but only 100 tests were made on each cotton ; the value of ' σ ' was calculated from the residual variance obtained after eliminating the effect of varieties by the analysis of variance. Fisher's g_1 and g_2 were used to test the normality of the frequency distribution of swollen diameter for each cotton.

For the determination of swollen diameter, a maturity slide was prepared in the manner described in an earlier bulletin ; the fibres were spread out and carefully separated by a blunt needle, they were irrigated with 18% caustic soda solution, and one reading near the middle of each fibre was taken on a micrometer scale in the eyepiece of a microscope. As a result of this investigation, we recommend the following procedure for the accurate determination of this property :—

(1) Swollen diameter measurement (as described in this paper) should be carried out by two testers.

(2) Each tester should prepare a 'maturity slide' and take swollen diameter measurements on 75 fibres on cottons in general and on 100 fibres for special cottons.

(3) The mean results obtained by the two testers for the same cotton should not vary by more than 6% for special cottons and 7% for other cottons. If larger differences occur, tests should be repeated by one or both testers.

(4) The extreme variation for (P= .05) which may be expected between two cottons due to random causes is about 5% for mean values based on 150 tests, and about 4% for those based on 200 tests. If larger differences are observed, these may be due to the 'specific treatment effects.'

Paper entitled " A Short Note on the Effect of Clinging Power of Fibres on Yarn-Strength Irregularity."—It is found that a distinct tendency exists for fibres possessing high clinging power to yield yarns which register high yarn-strength irregularity. This feature holds both for cotton fibres and staple (viscose) fibres spun either in the pure state or in a mixture. No direct proportionality between the two is observed owing to the following disturbing factors (1) fibre to fibre variation in clinging power, (2) sampling errors in single thread test and (3) lack of perfect homogeneity in the mixture.

Paper entitled " A Short Note on the Effect of Fibre-Weight per inch on the Spinning Quality of some Indian Cottons."—The earlier work of the Technological Laboratory had shown in regard to Indian cottons that the mean fibre-length plays the most important part in determining their spinning quality while the fibre-weight per inch takes the second place in this respect. In this analysis, however, no attempt was made to sort out and make spinning tests on such cottons as differed in respect of only one property but were similar in respect of the other fibre-properties. Accordingly, five botanically inter-related strains having practically the same mean fibre-length, but differing considerably in their mean fibre-weight per inch were tested in 1937-38. From the results of these tests the conclusion is drawn that an increase in the mean fibre-weight per inch of a cotton would, in general, be followed by a decrease in the strength of yarns spun from it, that this decrease may, to some extent, be arrested if the cotton possessing a high fibre-weight per inch also possesses high fibre-strength but that it would be accentuated if the increase in the fibre-weight per inch is associated with a decrease in fibre-strength.

Paper entitled " The Effect of Environmental and Genetical Factors on Fibre-maturity of Cotton."—All changes in plant characters are either environmental or genetical in origin. To what extent each of these modify fibre maturity of cotton is the subject of the present investigation for which suitable material was obtained from five well-designed experiments laid out at the Institute of Plant Industry, Indore. Samples from only two of these experiments

have so far been tested, while work is in progress on the remaining material. The results obtained have yielded the following conclusions :—

A. *Agronomical factors* in regard to P.A. *289F* and Mollisoni.—

(1) Out of the two sowing periods May suited P.A. *289F* while June helped Mollisoni to attain their best fibre-maturity percentages.

(2) Preparatory cultivation consisting of fallow in *Kharif* and wheat in *Rabi* repeated over two years proved beneficial only to the fibre-maturity of P.A. *289F*, while Mollisoni did well without this treatment.

(3) *Heavy irrigation* comprising eleven waterings as compared to *Moderate irrigation* of six waterings was helpful in raising the fibre-maturity of both cottons. Mollisoni, however, did equally well with moderate irrigation in the absence of preparatory cultivation.

(4) The fibre-maturity of P.A. *289F* was benefited by the application of 'Nicifos' more than 'cake' or no-manure, while to Mollisoni 'cake' suited better than 'Nicifos' or no-manure.

(5) Single spacing as opposed to double spacing improved the maturity of both cottons.

B. *Hybridization factors* in relation to three-parent varieties—Malvi, Bani, and Cwn 520 and their three F_1, crosses.

(1) Mean fibre-maturity of the hybrids showed positive improvement or heterosis over those of the parents.

(2) Variance due to variety was found significant for 100 : 1 odds, while that due to blocks, plots and plants was non-significant.

Paper entitled "The Effect of Storage at Different Relative Humidities on the Strength and Colour of Cotton."—It is common knowledge that cotton loses both in strength and whiteness on storage; but very little systematic work appears to have been done on this subject. An investigation to obtain systematic data both on strength and whiteness, together with the rate of growth of micro-organismal infection, has been undertaken at the Technological Laboratory, Matunga.

Two cottons, Broach Palej and B. D. 8, were selected for this purpose and stored over different relative humidities. Certain difficulties were encountered in the beginning in ensuring the proper humidities but they were eventually overcome and the correct humidities obtained by using solutions of calcium chloride and pure water in properly sealed desiccators.

The results obtained so far indicate that both cottons stored for about four months in an atmosphere of saturated relative humidity (which read only 96% on a dew-point hygrometer) completely deteriorate in strength and suffer enormously in colour owing to heavy formation of fungal spores. The effects are progressive with time and observation on strength tests made every fortnight gives their rates of development. At lower relative humidities, *i.e.*, 90%, 75% and 60% no deterioration in strength or whiteness has been observed in 4 months in B. D. 8, while in Broach Palej a slight tendency to increased infection and some loss in strength and whiteness has been noticed at 90% R. H. in the same period. Cottons kept at still lower relative humidities, *i.e.*, 30% and dry, the latter over anhydrous granulated calcium chloride did not show any loss in strength even in one year. These experiments are in progress.

V. GENERAL.

Visit of His Excellency the Viceroy.—His Excellency the Viceroy honoured the Laboratory by a visit on the 24th January 1939. His Excellency was received at the entrance by Sir Chunilal V. Mehta, Mr. D. N. Mahta and the writer. Invitations had previously been issued to the members of the Technological Research Sub-Committee, Standing Finance Sub-Committee and the Local Sub-Committee and the Vice-President introduced the members present on the occasion to His Excellency who was then shown the work of the Laboratory, in the various sections, by the writer. His Excellency evinced keen interest in the different researches and routine tests in progress and was pleased to express his general approval.

Among the important visitors the following may be mentioned :—

(1) The Hon'ble Khan Bahadur Major Sir Sikander Hyat Khan, K.B.E., Premier of the Punjab.

(2) The Hon'ble Honorary Major Nawabzada Malik Khizan Hiyat Tiwana, O.B.E.

(3) The Hon'ble Mian Abdul Haye, Minister for Education, Punjab.

(4) The Offg. Agricultural Expert, Imperial Council of Agricultural Research.

(5) The Hon'ble President and members of the Textile Labour Inquiry Committee, Bombay.

(6) Members of the Society of Textile Chemists, Bombay.

(7) Prof. John D. Orthard, Ph.D., Professor of Economic Geography, Columbia University, U.S.A.

(8) A party of students of the Ramnarayan Ruia College, Bombay.

(9) A party of students of the Calcutta University.

(10) A party of students of the Agricultural College, Poona.

(11) A party of students of the Government Central Textile Institute, Cawnpore.

(12) A party of students of the Agricultural Institute, Baroda.

The Technological Assistants working in the mofussil laboratories attended the Laboratory in November and December 1938 for the refresher course and the conference of Technological Assistants. This conference took place on the 13th and 14th December 1938 in the Laboratory. The subjects which had previously been sent up by the Technological Assistants were discussed in full.

The Second Conference between the practical carders and spinners and the senior staff of the Laboratory took place on the 5th October 1938. The carders and spinners selected by the Millowners' Association, Bombay, and the Senior Staff of the Laboratory attended this Conference and took part in the discussions.

Equipment.—The following apparatus and machines were added to the equipment of the Laboratory during the year :—

(1) Oertling Aperiodic Balance.

(2) Texray Lamp for cloth examination.

(3) One Weft Ring Frame of 48 spindles.

(4) One 2.5 B.H.P. Slipring induction Motor to drive the weft ring frame.

The weft ring frame mentioned above has been specially designed. While one side is built according to the latest standard practice, the other side has been so built as to enable one to study the effect of various factors such as inclination of rollers, distance between roller nip and spindle point, etc. These tests will be taken in hand when opportunity permits. My best thanks in this connection are due to Mr. F. Stones, who gave valuable advice.

During the period under review the Committee sanctioned a sum for the installation of additional equipment at the Laboratory for maintaining constant humidity and temperature throughout the year. The specifications of the plant required for this purpose have been worked and it is hoped that the plant would be installed at an early date when all the spinning and yarn tests carried out at the Laboratory would be made under strictly controlled and reproducible conditions throughout the year.

The Committee also sanctioned the purchase of the latest model of a 2-head Nasmith Combing Machine to replace the 10-year old model in accordance with its policy of maintaining the equipment of the Laboratory in an up-to-date condition in the best interests of textile research and industry. Order for this machine has been placed and it will be installed in the near future.

Full details of the technical staff of the Laboratory are given in Appendix III, while leave and other arrangements relating to the staff are mentioned below :

Mr. D. L. Sen, Senior Research Assistant, proceeded on privilege leave from the 26th September to 5th November 1938 and from 13th February to 5th March 1939.

Mr. N. Hari Rao, Senior Research Assistant, proceeded on leave from the 5th October 1938 to 12th November 1938.

Mr. R. S. Koshal, Senior Research Assistant, whose services were placed at the disposal of the Punjab Government in connection with the work of revision of standard yields, returned to the Laboratory on the 8th September 1938.

Mr. V. V. Gupte, Spinning Master, proceeded on leave from the 4th April 1939 to 20th May 1939.

Mr. Srinagabushana, B.Sc., Technological Assistant, Surat, was appointed Junior Research Assistant vice Dr. K. R. Sen appointed Senior Physicist in the Research Laboratories of the Indian Central Jute Committee at Calcutta. He joined the Laboratory on the 2nd November 1938.

Mr. M. U. Parmar was appointed Technological Assistant at Surat in place of Mr. Srinagabushana, but as he could not immediately take charge of his duties at Surat because his services were required at the Laboratory to complete his investigation, the vacancy at Surat was temporarily filled up by Mr. K. V. N. Nayar, Junior Tester. He returned to the Laboratory on the 30th January 1939 after being relieved by Mr. M. U. Parmar, who commenced his appointment as Technological Assistant, Surat, on 26th January 1939.

Mr. S. N. Rao, Junior Tester, resigned his post with effect from the 1st June 1938 to take up an appointment in the Customs Department, Bombay. This post was permanently filled up by the confirmation of Mr. S. M. Nawaz, Officiating Junior Tester.

Mr. K. Birch, officiating Junior Tester, resigned his post with effect from the 3rd August 1938.

Messrs. S. B. Mogre and P. D. Vakil were appointed as officiating Junior Testers with effect from the 17th and 20th October 1938 respectively.

Two posts of temporary Junior Testers for a period of three months were created to cope with the additional work and Messrs. C. A. S. Iyer and Bhasker Rao were appointed to these posts.

Messrs. R. H. Mehta and A. A. Sharma were selected for training in the elements of cotton technology and yarn-testing. They joined the Laboratory on the 9th January 1939. Mr. Sharma was relieved, at his own request, on the 13th May 1939, while Mr. Mehta is continuing his training.

Exhibitions.—During the period under review, the Laboratory participated in the Poona Industrial Exhibition held at Poona from the 12th March to 24th April 1939. A large number of exhibits such as Halo cards, Baer Sorter patterns, card-sliver, yarn knots, etc. prepared from nineteen Indian cottons, together with samples of cloth were despatched to the Exhibition. These were also supplemented by a number of testing instruments. Mr. G. J. Kharkar, Junior Tester, was deputed for demonstration work and he remained on duty in Poona from the 10th March 1939 to 25th April 1939.

Furthermore, some framed posters and literature were supplied to the Inspector of Agricultural Publicity, Karachi, for exhibition at the All-India Industrial Exhibition, held at Karachi in March-April 1939.

Enquiries.—Since closer contact has been established between the Laboratory and the mills, a fairly large number of enquiries relating to different subjects, seeking advice or information, have been coming in each year. During the year under review the number of such enquiries showed a considerable increase, and every effort was made to give best available information or advice to those who consulted the Laboratory. Such enquiries are doubly welcome, as on the one hand they bring home the work of the Laboratory to mills, and on the other, give valuable information to the Laboratory as to the type of technical problems or difficulties which face the industry.

ACKNOWLEDGMENTS.

My best thanks are due to the office-bearers and members of the Committee for their support and the active interest they have taken in the Laboratory throughout the year and to Mr. Varjivandas Motilal of Messrs. Narandas Rajaram & Co., Bombay, for his kind assistance in valuing the numerous samples sent to the Laboratory for tests. The statistics given in the earlier part of this Report show that the work of the Laboratory has expanded and increased during the last few years and the year under review has been no exception to this rule. The completion of this work would not have been possible without the active and loyal co-operation of the staff of the Laboratory and I wish to take this opportunity to thank them all.

(Sd.) NAZIR AHMAD,
Director,
Technological Laboratory.

Dated the 24th June 1939.

APPENDIX III.

LIST OF SCIENTIFIC AND TECHNICAL STAFF OF THE TECHNOLOGICAL LABORATORY AS ON 31ST MAY 1939.

	Designation.	Name.	Remarks.
1.	Director	..Dr. Nazir Ahmad, O.B.E., Ph.D., F. Inst., P...	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga.
2.	Senior Research Assistant (Chemist)	..Mr. D. L. Sen, M.Sc., Tech. (Manch.), M.Sc., (Bom.), A.I.I.Sc., F.I.C.	Research Student of the Indian Institute of Science and Manchester College of Technology.
3.	Senior Research Assistant (Physicist) ..	Mr. N. Hari Rao, M.Sc. (Calcutta)	Research Scholar, Technological Laboratory (Textile Physics).
4.	Senior Research Assistant (Physicist) ..	Mr. R. S. Koshal, M.Sc. (Punjab)	Do. do.
5.	Spinning Master	Mr. V. V. Gupte, B.Sc., Tech. (Manchester) B.Sc. (Bombay).	....
6.	Junior Research Assistant	Mr. A. N. Gulati, M.Sc. (Punjab)	Imperial Institute of Veterinary Research, Mukteshwar, U.P.
7.	Statistician and Personal Assistant ..	Mr. V. Venkataraman, M.A. (Madras) ..	Statistical Assistant, Labour Office, Government of Bombay.
8.	Junior Research Assistant	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory (Textile Physics).
9.	Do.	Mr. Srinagabhushana, B.Sc.	..Research Scholar, Technological Laboratory and Technological Assistant, Surat.
10.	Senior Tester	Mr. H. B. Joshi, B.Sc.	....
11.	Do.	Mr. S. S. Sukthanker, L.T.C. (V.J.T.I.) ..	....
12.	Junior Tester	Mr. G. D. Bhide, B.Sc.	....
13.	Do.	Mr. K. V. N. Nayar	....

LIST OF SCIENTIFIC AND TECHNICAL STAFF OF THE TECHNOLOGICAL LABORATORY AS ON 31ST MAY 1939—(*contd.*)

	Designation.	Name.	Remarks.
14.	Junior Tester	Mr. V. N. Modak, B.Sc.	....
15.	Do.	Mr. L. V. Sundararaman, B. A.	....
16.	Do.	Mr. P. S. Sambamurthi	....
17.	Do.	Mr. R. G. Panvalkar, B.Sc.	....
18.	Do.	Mr. G. J. Kharkar, B.Sc.	....
19.	Do.	Mr. A. J. Farid	....
20.	Do.	Mr. P. V. Nachane, B.Sc.	....
21.	Do.	Mr. S. Samson, B.Sc., LL.B.	....
22.	Do.	Mr. C. S. Ramanathan, B.Sc.	....
23.	Do.	Mr. B. N. Prabhakar, B.Sc.	....
24.	Do.	Mr. S. M. Nawaz, B.Sc.	....
25.	Do.	Mr. S. B. Mogre, M.Sc.	....
26.	Do.	Mr. P. D. Vakil	....
27.	Statistical Clerk	Mr. R. Krishna Iyer	....
28.	Do.	Mr. P. K. Wagle	....
29.	Electrician	Mr. H. Lobo, L. E. E. (V.J.T.I.)	....
30.	Spinning Assistant	Mr. N. Iyengar	....
31.	Draughtsman	Mr. B. G. Mehta	....
32.	Mechanic	Mr. J. B. Kharas	....

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OF THE

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FOR THE

YEAR ENDING 31st MAY 1940

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INDIAN CENTRAL COTTON COMMITTEE

ANNUAL REPORT

OF THE

DIRECTOR

TECHNOLOGICAL LABORATORY

FOR THE

YEAR ENDING 31st MAY 1940

Annual Report of the Director, Technological Laboratory, for the Year ending 31st May 1940.

THE present report contains an account of the work done at the Technological Laboratory during the year ending 31st May 1940. It will be seen from a perusal of this report that the steady growth in the work of the Laboratory, noticed in the past years, was not only maintained but that its pace has even been accelerated. During the year under review the total number of samples received for various tests at the Laboratory reached the record figure of 768 as against 635 for the previous year, showing an increase of 21 per cent. It may be mentioned here that in 1930, when the writer assumed the charge of the Laboratory, the total number of samples received for tests stood at 345. Thus, during the last decade this number has increased by 120 per cent, and it is important to remember that this increase is due not only to the development of the older activities of the Laboratory, but also to the inauguration of new activities. Judging from the manner in which these new activities have been responded to by those who are in a position to take advantage of them, it can only be concluded that they have proved a notable success. The work of the Laboratory will now be described under six sections. It should be noted in this connection that a new section termed "Testing House" has been added in order to concentrate attention upon this important and recent development in the activities of the Laboratory. The following are the sections under which the work will be described in this report :—

I. Spinning Laboratory.
II. Testing House.
III. Research Laboratory.
IV. Moisture Testing Section.
V. Publications.
VI. General.

I. SPINNING LABORATORY.

As usual, the samples of cotton, yarn, cloth, etc., received for tests during the year under review have been classified in Table I, which also shows the corresponding figures for last year.

TABLE 1.—*No. of samples received for Tests.*

	1-6-38 to 31-5-39.	1-6-39 to 31-5-40.
Agricultural Departments	305	342
Standard Cottons	20	14
Trade Tests	48	51
Fibre Tests..	94	140
Yarn Tests..	50	80
Cloth Tests..	39	119
Dye Absorption Tests	2	..
Special Tests	77	22
Total ..	635	768

As stated in the opening paragraph, the total number of samples received for tests shows an increase of 21 per cent. over the high figure of 635 reached last year. The number of samples received from the Agricultural Departments shows a small increase over last year, but the increase was most pronounced in the case of cloth and yarn samples and somewhat less marked in the case of the samples received for fibre tests. Many of these samples were submitted by cotton firms and mills, and the fact that their numbers have shown a steady increase ever since the Testing House was inaugurated at the Laboratory is a proof of the confidence which the work of the Laboratory has inspired in the minds of those who have benefited from these tests. In fact it is not far wrong to say that all those cotton firms and mills who have once enlisted the aid of the Laboratory for tests of any description have come to it again and again, and that only those firms or mills who are as yet unacquainted with the work of the Laboratory have as yet failed to take advantage of the Testing House facilities.

In spite of the new developments in the work of the Laboratory relating to testing of samples for cotton firms and mills, the bulk of the work of the Laboratory is still done for the Agricultural Departments which was, and must necessarily remain, one of its primary concerns. The following statement C gives a summary of the agricultural samples which were spun during the period under review together with the names of the suppliers of the samples. It should be mentioned that in addition to the samples received from the Agricultural Departments, other types of samples, such as standard Indian cottons, trade varieties, etc., are also tested at the Laboratory. Details relating to the standard Indian cottons will be found on page 9, while information pertaining to the trade samples supplied by the East India Cotton Association or through the Millowners' Associations of Bombay and Ahmedabad will be given on page 11.

STATEMENT C.

BOMBAY.

(1) *The Cotton Breeder, Jalgaon.*—13 samples of Jarila, Banilla and N. R. 6.

(2) *The Cotton Breeder, Dharwar.*—9 samples of crosses.

(3) *The Cotton Breeder, Surat.*—3 samples of strains.

(4) *The Cotton Breeder, Broach.*—11 samples of B.D. 8 crosses.

(5) *The President, Taluka Development Association, Nawapur.*—4 samples of 1027 A.L.F. cotton.

(6) *The Agricultural Overseer, Hansot.*—2 samples of 1027 A.L.F. and Segregate 8-1.

SIND.

(1) *The Botanist in Sind, Sakrand.*—7 samples of Boss III, Sea Island and other hybrids.

(2) *The Second Cotton Superintendent, Dadu.*—1 sample of 4F-98 cotton.

PUNJAB.

(1) *The Cotton Research Botanist, Lyallpur.*—61 samples of selections and mixtures.

UNITED PROVINCES.

(1) *The Economic Botanist to Government, U.P., Cawnpore.*—66 samples of C402, C520, Perso-American and other selections.

MADRAS.

(1) *The Superintendent, Agricultural Research Station, Koilpatti.*—15 samples of strains and other selections.

(2) *The Superintendent, Dry Farming Station, Bellary.*—9 samples of H. 1 and Co. 2 cottons.

(3) *The Gazetted Assistant, Mungari Scheme, Adoni.*—4 samples of selections and Local.

(4) *The Assistant to Cotton Specialist, Srivilliputhur.*—2 samples of Uganda crosses.

CENTRAL PROVINCES.

(1) *The Research Officer, Cotton Breeding Scheme, Akola.*—5 samples of selections.

MISCELLANEOUS.

(1) *The Director, Institute of Plant Industry, Indore.*—37 samples of selections.

(2) *The Economic Botanist, Mysore State, Bangalore.*—5 samples of strains.

(3) *The Inspector of Cottonseed Distribution, Kopbal.*—7 samples of Jayawant and Kumpta selections.

(4) *The Superintendent, Government Main Farm, Raichur.*—5 samples of selections.

(5) *The Cotton Research Botanist, Parbhani.*—13 samples of Gaorani selections and Parbhani American.

(6) *The Empress Mills, Nagpur.*—One sample of Bhainsa Gaorani 6 cotton.

(7) *The Economic Botanist, Baroda State, Baroda.*—13 samples of Karkhedi selections and Broach 9.

(8) *The Assistant Cotton Breeder, Jagudan.*—6 samples of Wagad, Segregates and other selections.

(9) *The Deputy Commissioner, Garo Hills, Tura (Assam).*— 1 sample of Garo hill cotton.

(10) *The Director of Agriculture, Patna.*—1 sample of Gomia Thana cotton.

(11) *The Senior Botanist, Department of Agriculture, Uganda.*—8 samples of Uganda cottons.

The following Tables II and III give the distribution of samples and yarns spun at the Laboratory during the period under review, together with the corresponding figures for previous years since 1924-25.

TABLE II.—*Distribution of Samples Spun*, 1924-40.

PROVINCE	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.	1939-40.
Bombay ..	18	26	22	22	28	66	89	69	143	111	97	59	67	44	78	42
Sind	..	..	..	..	..	..	..	..	..	..	..	28	47	..	21	8
Punjab	14	1	..	..	42	30	10	44	55	42	23	71	9	45	57	61
U. P.	7	..	6	11	9	7	16	7	12	6	7	11	..	2	36	66
Madras ..	2	19	50	23	30	51	66	15	28	101	30	51	31	31	42	30
C. P.	2	..	3	2	2	5	3	3	5	9	9	10	15	9	9	5
Miscellaneous ..	3	11	..	6	6	27	28	33	75	97	85	100	85	97	104	97
Total ..	46	57	81	64	117	186	212	171	318	366	251	330	254	228	347	309
Standard Cotton Tests ..	8	54	49	64	33	34	27	18	18	16	18	23	15	21	21	19
Trade Tests & Special Tests	..	..	..	..	..	37	89	134	125	166	131	143	162	185	172	122
Grand Total ..	54	111	130	128	150	257	328	323	461	548	400	496	431	434	540	450

TABLE III.—*Distribution of Yarns Spun*, 1924-40.

PROVINCE	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.	1939-40.
Bombay	103	152	132	132	159	322	253	203	430	332	292	190	217	134	249	127
Sind	..	..	..	..	..	..	..	..	..	..	..	84	143	..	68	26
Punjab	106	14	..	..	254	113	31	136	165	127	72	220	28	144	168	195
U. P.	27	..	36	66	54	42	40	22	32	18	21	35	..	6	94	197
Madras	12	108	278	138	180	255	199	53	85	303	90	151	89	91	123	92
C. P.	8	..	18	12	12	30	12	9	15	27	29	30	45	28	26	15
Miscellaneous ..	3	58	..	36	27	99	100	93	227	293	250	295	261	292	299	281
Total ..	259	332	464	384	686	861	635	516	954	1100	754	1005	783	695	1027	933
Standard Cotton Tests	95	514	423	447	290	223	309	136	200	180	204	162	115	156	152	144
Trade Tests and Special Tests ..	..	..	..	..	..	80	343	502	256	499	810	609	649	665	498	423
Grand Total ..	354	846	887	831	976	1,164	1,287	1,154	1,410	1,779	1,768	1,776	1,547	1,516	1,677	1,500

It will be noticed that the number of samples as well as the number of yarns spun during the year show a small decrease as compared with the last year's figures. This is due to the fact that during the year the work in the Spinning Laboratory had either to be slowed down or stopped for a few weeks in order to instal the new de-humidifying plant and to carry out such repairs to the old humidifying plant as were found to be necessary on examination after its continuous service of nearly 15 years. All the necessary repairs to the old plant have been carried out and the new plant has been installed. Since the erection of the new plant, the work has been speeded up so that all the samples received in the year under review may be spun and tested before the next year's cottons make their appearance. It should be mentioned here that with the installation of the de-humidifying plant, the temperature and humidity conditions can be maintained at a uniform level in the spinning and the yarn and cloth testing rooms, regardless of the conditions—hot, cold, wet or dry—prevailing outside. The tests can now be performed throughout the year under the same conditions, while these conditions can be varied at will within a certain range, if so desired, for special tests. In these respects the spinning room and the yarn and cloth testing room can compare favourably with similar institutions anywhere in the world.

The following Table IV gives a summary of the reports of different types issued from the Laboratory during the period under review, together with the corresponding figures for the previous years :—

TABLE IV.—*Test Reports Issued*, 1924-40.

REPORTS	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.	1939-40.
Spinning Test ..	7	19	19	22	21	63	92	60	87	121	112	135	129	109	127	114
Fibre Test ..	1	1	5	1	7	4	7	19	30	18	19	44	52	32	35	42
Yarn Test ..	..	..	..	1	4	4	2	3	5	3	7	13	10	14	20	36
Cloth Test ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	25	69
Statistical Analysis	..	..	..	..	..	..	..	..	..	..	..	..	..	3	3	..
Miscellaneous ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Total Reports ..	8	20	24	24	32	71	101	82	122	142	138	192	191	158	211	261

It will be noticed that the total number of reports issued in the year under reference rose to the high figure of 261 as against 211 of last year, showing an increase of nearly 24 per cent. It was pointed out elsewhere that as compared with 1929-30 when the writer assumed charge of the Laboratory, the number of samples had increased more than two-fold. It will be noticed that the number of reports issued during this period has increased nearly four times, showing the larger circle of people who now come into contact with the work of the Laboratory. This increase, as may be expected from the preceding account, is most pronounced in the case of the cloth and yarn test reports, while the spinning test reports show a small decrease owing to the partial stoppage of work in the spinning room as explained above.

The following table gives the strength of the staff employed at the Laboratory on 31st May 1940 together with the corresponding figures for the previous years :—

TABLE V.—*Permanent Staff*, 1924-40.

	1924.	1925.	1926.	1927.	1928.	1929.	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.	1938.	1939.	1940.
Technical and Office staff ..	8	11	20	24	27	27	32	32	32	33	34	34	35	36	36	36	38
Research students ..	1	3	6	4	3	2	1	1	..	..	..	..	2	2	2	1	..
Fumigation Chemists ..	..	..	2	4	2	2	2	2	2	2	2	2	2	2	2	2	2
Total ..	9	14	28	32	32	31	35	35	34	35	36	36	39	40	40	39	40

It will be noticed that in spite of the steady increase in the work of the Laboratory, the strength of the staff has remained practically the same as before. Only two new posts of Junior Testers were created in order to cope with the heavy pressure on the Yarn and the Fibre Testing Sections. As one of the research studentships held at the Laboratory came to an end during the year under review, the total staff employed numbered 40 as against 39 in the last year.

Most of the samples tested at the Laboratory were of a routine nature, but some of them possessed special features which are worthy of mention. These are as follows :—

A. AGRICULTURAL SAMPLES.

(1) *Cottons grown on Chalka soil.*—At present Mungari cotton is grown in the *khariff* season in certain parts of Raichur District, Hyderabad State, which possess 'chalka' (granite) soil. The Cotton Research Botanist, Parbhani, carried out an experiment in which a few selections from Hyderabad-Gaorani and Bani 306 were grown in this area. The samples raised by him were tested at the Laboratory and were found to give satisfactory spinning performance. If the factors of yield per acre, ginning percentage, stand in the field, etc., are favourable and if the strains continue to maintain their good performance, they would represent a very considerable improvement over the local Mungari cotton grown at present in this area.

(2) *Strains resistant to root-rot disease.*—Eleven strains of Kharkhedi cotton, which were found to be resistant to root-rot, were tried in Baroda against Broach 9. It was found that even though these strains possessed the advantage of being resistant to root-rot, they were very much inferior to Broach 9 in their spinning performance. Their inferiority in this respect is in all probability due to the coarseness of their fibres.

(3) *Effect of different sowing dates on Co. 2 cotton.*—Three samples of Cambodia Co. 2 cotton sown at intervals of one month each on 1st July, 1st August and 1st September were received for tests from the Superintendent, Dry Farming Station, Bellary. The results of the tests carried out on these samples showed a progressive improvement in the spinning performance with advance in the date of sowing, but it was observed that this improvement was not commensurate with the lower yields per acre of the later sown samples.

(4) *Breeding of wilt-resistant strains in Surat and Broach Districts.*—By crossing 1027 A.L.F. and 1A Long Boll the Agricultural Department of Bombay Province has evolved a new strain called 'Segregate 8-1.' This strain has proved a better resistant to wilt and, in the past, has been found to inherit the good qualities of both of its parents. During the period under review 1027 A.L.F. and Segregate 8-1, grown in the wilt affected area at Shera near Ankleshwar, were tested, and the two cottons were found to give very nearly equal performance. Furthermore, samples of Segregate 8-1, grown this year at Surat, gave a lower performance than 1027 A.L.F.

Mill tests on large size samples were also arranged for these three cottons, namely, 1027 A.L.F., Segregate 8-1 and 1A Long Boll. It was noticed that 1027 A.L.F. gave the best and Selection 1A Long Boll the poorest results, while Segregate 8-1 took the intermediate position. Arrangements for similar mill tests have also been made for the current year's samples.

(5) *Cultivation of* 1027 *A.L.F. in West Khandesh.*—This cotton has been tried for the second year in four different centres in Nawapur Peta in the western half of West Khandesh adjoining the Surat district. The object of these trials is to find out whether the cotton raised in this area is equal or inferior to that grown in the Surat district. It was found that in both seasons the samples raised in Nawapur Peta are equal in performance to the cotton grown in Surat.

(6) 289*F cotton grown in Bengal.*—During the last few years a number of cotton mills have been put up in Bengal, and consequently efforts are being made to grow suitable varieties of cottons in the Province. The seed of P. A. 289F obtained from the Punjab was tried in six different localities, namely, Dacca, Chittagong, Murshidabad, Naogaon, Bankura and Midnapore, which differ considerably in their climate and soil. The samples raised in these six places revealed considerable variation in their spinning performance and degree of yarn neppiness. It was found that the Bankura sample gave the best performance, which was equal to that of P. A. 289F grown in the Punjab, the Murshidabad and Naogaon samples came next in order, while the Midnapore, Chittagong and Dacca samples took the last place in respect of spinning performance. It was further observed that samples from Chittagong and Dacca, which are situated in Eastern Bengal, possessed the highest fibre-weight per inch, while the samples from Bankura and Midnapore differed appreciably in staple length and spinning performance in spite of the fact that these two places have very nearly similar soils.

(7) *Garo Hill cotton.*—This cotton, grown in the northern part of Garo Hill district in Assam, possesses a number of interesting features. The seed is sown in April/May and the crop is harvested in January/February of the following year. From May to September the crop receives a very heavy rainfall, which may amount to 115 inches. The plants often attain heights of 12 to 15 feet. The cotton possesses high seed weight, high lint index and high ginning percentage as compared with the *Desi* cottons of U. P. and the Punjab. The lint, however, is short and very coarse, its fibre weight per inch being probably the highest recorded in the Laboratory. Owing to its rough feel and high fibre-weight per inch this cotton should be well suited for mixing with short staple wool or for such other non-textile purposes as the manufacture of gun cotton, hospital lint, etc. In view of the special features possessed by this cotton, a short note was published on it in the September 1939 issue of the " Current Science."

(8) *American varieties in United Provinces.*—Two American varietiee 47F and 58F, were tried at Raya in U.P., and the samples were sent to ths Laboratory for tests. The results of these tests showed that 47F was equal in performance to P. A. 289F, while 58F was slightly inferior. These results indicated the desirability of carrying out further trials on these two varieties. If they can maintain their good performance in the ensuing seasons and are satisfactory as regards field characters, they would represent a considerable improvement over the types grown at present in the United Provinces.

(9) *Sind cottons.*—The Director of Agriculture, Sind, Karachi, expressed the desire that a short note on the fibre-properties and the spinning performance of the two Sind cottons, 4F-98 and Sind Sudhar, may be written up with the object of bringing home their merits to consumers in Lancashire. Accordingly, a note, based on the tests performed on these varieties in the previous years, was prepared and sent to the Director of Agriculture, Sind, for further action.

(10) *Cambodia Cotton in Bihar.*—Alongside of Bengal, Bihar is also trying to grow suitable varieties of cotton. During the period under review two samples of Cambodia, one of lint and the other of seed-cotton, were received from the Director of Agriculture, Bihar. These had been grown in the demonstration plots at Gomia Thana in the Hazaribaug District. The soil in this locality is of the red laterite variety, and the rainfall averages 45 to 50 inches a year. The tests carried out on these samples showed that the seed-weight, the lint-weight and the ginning percentage were all appreciably lower than those obtained for Co. 2 cotton grown in Coimbatore. Furthermore, the staple of the cotton grown in Bihar was also very considerably shorter and coarser than that of the Coimbatore cotton, as a result of which the Bihar cotton was found to be suitable for spinning only upto 7's standard warp counts as against 30's for the Coimbatore samples.

(11) *Uganda cottons.*—As in the past, spinning tests were carried out during the year under review on 8 samples of Uganda cottons which were

supplied by the Senior Botanist, Department of Agriculture, Uganda. In view of the special importance of these cottons.

(12) *Tests on mixtures of Punjab cottons.*—D. C. 6 has now replaced *Desi* cotton over a large area in the Punjab. The Cotton Research Botanist, Lyallpur, requested that as in the last year, tests may be made on mixtures containing varying proportions of P.A. 4F and D.C. 6 cottons. These tests were accordingly carried out, and a detailed report was issued to the Cotton Research Botanist, Lyallpur. The results obtained may be summarised by stating that the admixture of 10 per cent. D. C. with 4F brought down the spinning performance by nearly 4 counts, while a further admixture of 10 per cent. lowered the spinning performance by another 3 counts. After the 20 per cent. mixture, there is a slow and steady fall in the spinning performance as the proportion of D. C. 6 is gradually increased. It is interesting to note in this connection that although D. C. 6 of this year had a higher mean fibre-length than 4F, its performance is so much lower that it stood in an altogether inferior class. This was undoubtedly due, to a large extent, to the relative coarseness of its fibre.

(13) *Mill tests on Malvi 9 cottons.*—In order to find out how the new selection M. 9-20 compares with Malvi 9 when tested in bulk, arrangements were made for mill tests on these two cottons in 3 different mills. These cottons were also tested at the Laboratory, and it was found that although they resemble each other closely in respect of mean fibre-length and fibre-weight per inch, waste percentage, evenness and neppiness of yarns, M. 9-20 gave, on the whole, somewhat stronger yarns than M. 9. This result of the Laboratory was confirmed by the mill tests which showed a small advantage in favour of M. 9-20.

(14) *Dhar and Musakhedi Upland cottons.*—Samples of these two cottons grown on adhan and barani lands from the Institute of Plant Industry seed and Kharva seed were grown at Indore and at Kharva and were tested at the Laboratory. These tests showed that: (1) Dhar-Upland grown with the Indore Institute of Plant Industry seed on adhan land gave the best results as regards the fibre-length and spinning performance, (2) among the two seeds, the Indore Plant Industry seed gave somewhat better results than the Kharva seed, (3) among the two cottons, Dhar-Upland possessed better staple length than the Musakhedi-Upland, and (4) the crop raised on the adhan land was somewhat superior in length to that raised on the barani land.

B. Standard Indian Cottons.

These cottons, as usual, were subjected to detailed examination of their fibre-properties and spinning performance and the results of these tests were published in the form of a Technological Bulletin, Series A, No. 49, in July 1939. Prior to the publication of this bulletin, technological circulars had been issued on those cottons which had been received fairly early in the season.

The following statement shows the names of the standard cottons of the 1939-40 season which have already been received at the Laboratory and on which tests have either been completed or are in progress :—

BOMBAY :

1. Jayawant.
2. Gadag 1 (Dharwar-American).
3. Surat 1027 A.L.F.
4. Wagad 8.

SIND :

5. Sind Sudhar (289-F-1).
6. Sind N. B. (W. N. 27).

PUNJAB :

7. Punjab-American 4F.
8. Punjab-American 289 F.
9. L. S. S.
10. Mollisoni.

UNITED PROVINCES :

11. Aligarh A. 19.
12. C 402.

CENTRAL PROVINCES :

13. (*a*) Verum 262 (Nagpur).
    (*b*) Verum 262 (Akola).
14. V. 434 (Akola).
15. Late Verum (Nagpur).

HYDERABAD :

16. Umri Bani.

MADRAS :

17. Cambodia Co. 2 (Cambodia 440).
18. Nandyal 14 (Northerns).
19. Hagari I (Westerns).
20. Karunganni C. 7.
21. Koilpatti (K. 1).

The Local Sub-Committee of the Indian Central Cotton Committee, on the recommendation of the Director of Agriculture, Punjab, decided that L.

S.S. should be included in the list of standard Indian cottons. Accordingly a sample of this cotton has been requisitioned from the 1939-40 crop and the test results will be included in the next bulletin.

The following standard cottons of the 1939-40 season were received fairly early in the season, and consequently Technological Circulars were issued on them during the period under review :—

(1) Verum 262 (Nagpur).

(2) Late Verum (Nagpur).

(3) V. 434 (Akola).

(4) Verum 262 (Akola).

(5) Umri Bani.

Tests on the remaining standard cottons are in progress, and when all the results are available they will, as usual, be embodied in the form of a Technological Bulletin.

C. Trade Varieties.

In accordance with the arrangement entered into between the Indian Central Cotton Committee on the one hand and the East India Cotton Association, Bombay Millowners' Association and the Ahmedabad Millowners' Association on the other hand, samples of fair average quality of the chief trade varieties or of the early arrivals of these cottons in the local market were received and tested in the Laboratory during the period under review. The results of these tests were published in the form of Technological Circulars, which were broadcast to the trade and industry, and later on these circulars were compiled in the form of a Technological Bulletin entitled "Technological Reports on Trade Varieties of Indian cottons, 1939" which was published in September 1939. It should be mentioned in this connection that the 1938-39 samples were requisitioned in accordance with the revised list which was approved by the Committee at its meeting held in Lyallpur on 19th November 1938. In preparing this list, 16 cottons were removed from it, while 8 new cottons were added to it. Of these new cottons, recommended for inclusion in the revised list, samples of V. 434, Gaorani 6, 289F/43 and 289F/K. 25 could not be supplied by the East India Cotton Association on the ground that these cottons were not marketed under these names in the local market. On re-consideration of the matter, the Committee decided to delete 289F/K. 25 from the list. Furthermore, from the revised list, samples of four cottons, namely, Latur, Cambodia, Tinnevelly and Karunganni were not received for tests. A new feature of this year's bulletin to which attention may be drawn here is the inclusion of a summary table which brings out the comparative results of the trade varieties and the corresponding standard Indian cottons. In general, a discrepancy exists between the results of two series of tests, the samples of the standard cottons giving better results than the trade samples. These differences are due to

the operation of such factors as the lack of pure seed, inadequate water supply, bad picking, defective ginning, adulteration of superior with inferior variety, etc., and the magnitude of the difference in most cases is an indication of the extent of operation of one or more of these factors.

From the 1939-40 crop the following samples of trade varieties were received at the Laboratory and the results of tests made on them were published during the period under review in the form of technological circulars. A list of the circulars issued in this period will be found under the head "Publications."

1. *Samples supplied by the East India Cotton Association.*

1. C. P. No. 1.
2. Berar.
3. Khandesh.
4. Latur.
5. Punjab-American 4F.
6. Punjab-American L.S.S.
7. Punjab-American 289F.
8. Sind-Sudhar (289F-1).
9. Broach.
10. Navsari.

2. *Samples supplied through the Millowners' Association, Bombay.*

1. Farm Westerns.
2. Bailhongal.
3. Broach.
4. Westerns.
5. Miraj.
6. Tirupur Cambodia.
7. Ujjain (Ujjain).
8. Surat.
9. Navsari.
10. Kumpta.

3. *Sample supplied through the Ahmedabad Millowners' Association, Ahmedabad.*

1. Jagadia.

D. Technological Tests.

(1) *Empirical relationships between count, twist and strength of cotton yarns.*—It will be remembered that the problem of predicting the lea-breaking strength of a cotton for a specified count from its known strength in any one count into which it may have been spun was successfully tackled at the Laboratory, and a formula connecting the two above-mentioned factors was evolved. An account of this investigation has already been published in a Technological Bulletin. During the period under review this investigation was carried a stage further and another formula was evolved by which it is possible to predict the single-thread strength of any specified count from the known strength of the count into which an Indian cotton may have been spun. Furthermore, since some data was already available at the Laboratory on the effect of twist on the lea strength, single-thread strength and ballistic work of rupture of yarns spun from a few cottons, and as it was felt this data would be useful to the users of these cottons among the Indian cotton mills, the available results were also compiled together. The results of the two

above-mentioned investigations were published during the period under review in the form of a Technological Bulletin, Series A, No. 48, a summary of which will be found under the head 'Publications.'

(2) *Deterioration of B.D. 8 cotton with lapse of time.*—This investigation arose out of an earlier one which was conducted on Broach cotton with the object of finding out the rate and extent of deterioration with lapse of time. In the present investigation, which was extended to B.D. 8 cotton owing to its spread in the Broach area, samples were drawn at regular intervals of about six months each from a bale of B.D. 8 cotton stored at the Technological Laboratory, and each sample was tested for fibre properties, spinning performance and the incidence of micro-organismal infection. So far five such samples have been drawn and tested and a report containing the results is under preparation.

(3) *The effect of different treatments of kier boil and bleach on quality of yarns spun from Indian cottons.*—This investigation was undertaken jointly with the Department of Chemical Technology, University of Bombay, and was divided up into two parts. The first part dealt with the effect of 7 kier boil and 3 bleach treatments and a bulletin containing the results of this part was written up during the period under review and is being sent up for publication. A summary of the bulletin will be found under the head 'Publications.'

The experimental portion of the second part of this investigation which took into account 13 kier and 2 bleach treatments has been completed and the writing up of the Bulletin dealing with this part of the investigation has been taken in hand.

(4) *Effect of storage on the quality of Indian cottons.*—In view of the fact that sometimes fairly large quantities of Indian cottons belonging to one season are carried over to the next one or two seasons, it was decided to undertake an investigation on the effect of storage on the quality of typical trade varieties of Indian cottons. In this investigation the attempt has been made to investigate the change, if any, in the fibre properties, spinning quality, colour and copper number of the samples when stored over a period of two years. The material for the tests consisted of 54 bales belonging to 6 varieties of cottons which was stored at Sewree under the conditions prevailing for the ordinary trade bales. The samples for tests were drawn from these bales at intervals of six months. During the period under review the last set of samples have been drawn and the fibre and spinning tests are in progress.

(5) *Mixtures of staple fibre and Indian cottons.*—A preliminary study of the spinning quality of mixtures made from Indian cottons and staple fibre was carried out sometime back at the Laboratory. In view of the extensive use of staple fibre in mixtures with Indian cottons, it was decided to extend this investigation to cover a wider range of length and filament denier and also to investigate the optimum conditions for processing these mixtures. Tests have now been completed on mixtures of Cambodia Co. 2, Jayawant and 1027 A.L.F. with a staple fibre 1″ long and 1.5 denier filament. This investigation is in progress.

(6) *Effect of employing different treatments in the blow-room.*—Sometime back, the Indian Central Cotton Committee decided that the whole problem of employing different beater speeds in the crighton opener and the scutcher, of giving different number of treatments in these machines, of employing different sequences of machines in the blow-room on the spinning behaviour of Indian cottons and the quality of yarns spun from them should be investigated at the Laboratory. Accordingly, a beginning has been made by studying the effects of using different speeds of beater and fan in the crighton opener and giving different number of treatments in this machine. So far these tests have been completed on Bengals cotton, and they are now in progress on P. A. 289F. It may be mentioned here that in addition to the ordinary fibre and yarn tests, the representative samples after each treatment are being tested for any mechanical damage done to fibres in their passage through the opening machines.

(7) *Comparison of mill and Laboratory tests.*—The question of the divergence between the mill and the Laboratory tests has arisen again and again, especially since a closer liaison has been established between the mills and the Laboratory. The tests at the Laboratory are made on small samples of cotton and it is possible to give individual attention, by the technical staff to each sample. In the mills the cottons are handled in bulk and it may not always be possible to give the same attention to each sample. As a result, a certain amount of difference is bound to exist between the Laboratory and the mill tests, even though the Laboratory adopts the general mill practice in the testing of its samples. Such differences have been observed in every place where similar institutions for testing samples have been established. Furthermore, in view of the fact that the type of machinery, the nature of treatment, the degree of attention, etc., varies from mill to mill, it is not always possible to say that the same magnitude of difference shall hold between the Laboratory on the one hand and the different mills on the other. In spite of these difficulties, since the mills were anxious to use the results of tests carried out at the Laboratory on trade samples and their own samples and to interpret them according to their needs, the Indian Central Cotton Committee decided that comparative tests should be made at the Laboratory and in some of the local mills on four Indian cottons to find out, as accurately as possible, the extent by which the results differed at the two places. Accordingly, one bale each of P. A. 289F, Broach, Oomra and Jayawant cottons were purchased and arrangements were made with three local mills for testing each of these four cottons, which were also subjected to the usual tests at the Laboratory. These tests were made not only on samples of lint, but also on scutcher laps, card slivers, roving bobbins, prepared from each sample in each mill, so that it may also be investigated whether the observed difference between the Laboratory and the mill tests occurred in a progressive manner or appeared somewhat abruptly at a particular stage. The results of these tests showed considerable variation from mill to mill, and they also showed that whereas in one mill the observed difference occurred more or less progressively, in another it made its appearance at a definite stage. In view of these findings and the uncertainty caused by them in arriving at a reliable

mean correction, the Indian Central Cotton Committee, which considered these results at its meeting in January 1940, decided that these tests should be extended to more Indian cottons and to a larger number of mills. Accordingly, arrangements are being made with the assistance of Mr. Maloney, Secretary, Millowners' Association, Bombay, who has very kindly offered to help the Laboratory in this matter, to make these tests on a larger number of cottons in collaboration with a larger number of mills.

(8) A weft ring frame of the latest type was added to the equipment of the Laboratory during the period under review. This ring frame possesses some special features, one of which is that the angle of inclination of rollers can be altered from 20° to 40°. Taking advantage of this feature, a preliminary study of the quality of weft yarns spun from P. A. 289F, especially with the different inclinations of the rollers and with different twist multipliers, was completed during the period under review. These tests will be extended in due course on other Indian cottons suitable for spinning weft yarns.

II. TESTING HOUSE.

As briefly mentioned in the introductory remarks, this Section of the Laboratory has made remarkable progress during the period under review. In all 304 samples were received for tests of different kinds as against 145 samples during last year, showing an increase of more than 100 per cent. These samples included 20 samples for spinning tests, 80 samples for yarn tests, 117 samples for cloth tests, 67 samples for fibre tests, 19 samples for moisture tests and 1 sample for Shirley Analyser test. It may be mentioned here that the total number of samples received this year in this section is very nearly equal to that received in the Laboratory for all kinds of tests 10 years ago.

The tests carried out on these samples covered a very wide range. Many of them were necessarily of a routine character such as the determination of actual counts, number of turns per inch, reeds and picks per inch, tensile strength, etc. In several cases, however, the examination of the materials either constituted a small investigation or special tests had to be made on them. In some cases the mills encountering difficulties in the working of their material or observing defects in their finished products, referred their problems to the Laboratory for advice and guidance. Special tests falling under these heads are worthy of mention and they will be briefly described below. Besides giving the necessary information they will also indicate the wide range of tests which can now be carried out at the Laboratory and the manner in which the testing and research facilities available here can be used to help the industry in the solution of its technical problems.

(1) A cotton mill sent two samples of cloth, one bleached and the other grey, to the Laboratory. Both samples showed yellow stains on their selvedges and the mill wanted to know the cause of these stains as well as the best method for removing them. The necessary analytical tests were carried out, the cause of the stains was traced and a method by which they could be removed was indicated in the report issued from the Laboratory.

(2) A cotton mill sent three samples of inter bobbins and three samples of roving bobbins. All these six samples had been prepared from the same mixing with different treatments, and the mill wanted the bobbins to be spun in the Laboratory into a particular count with different twist multipliers in order to find out which treatment and which twist multiplier would be the most suitable for spinning the said count from the mixing. The necessary tests were carried out and a detailed report was issued to the mill.

Tests of this kind can be conveniently carried out at the Laboratory at a small cost to a mill which would derive very useful information regarding the optimum treatment, suitable twists, drafts, speeds, etc., for a particular count to be spun from a given mixing. If such tests were attempted by the mill itself it would have to allocate a part of its machinery for this purpose and the working cost would be much higher than the charges levied by the Laboratory.

(3) A cotton mill sent some insects which were found in its piece-goods godown and which had caused considerable damage to the material stored in it. The insects were identified and methods for storing the piece-goods in a comparatively safe condition as well as the measures for eradicating or reducing the nuisance caused by these insects were suggested in the report issued to the mill. My thanks are due to the Imperial Entomologist, New Delhi, who kindly helped me in identifying the insects.

(4) A firm sent a small sample of union fabric to be analysed in the Laboratory in order to find out the material from which the warp and the weft yarns in the fabric were prepared. The necessary tests were carried out and a report giving full details of the analysis of the cloth was issued to the firm.

(5) A mill submitted two samples of artificial silk cloth, one of which had soft feel and smooth appearance, while the other had a comparatively rough feel and presented a patchy appearance. The mill requested the Laboratory to compare these two fabrics, to trace the cause of the rough feel and the patchy appearance in one of them and to suggest measures which might avoid these defects in future. The necessary tests were carried out and methods for avoiding the rough feel and patchy appearance of the fabric were suggested in the report issued to the mill.

(6) Two different firms sent samples of rayon fabric which showed striations on their surface, giving rise to uneven appearance in the reflected light. The causes for these defects, noticeable at certain angles of reflection, were investigated and reports issued to the firms concerned.

(7) An up-country mill sent two samples of dyed yarns, one blue and the other brown, along with samples of grey yarns and the sliver from which these yarns had been prepared. It was found that the dyeing was unlevel in both yarns and the mill wanted the Laboratory to investigate the causes responsible for the unlevel dyeing. After making the necessary tests, it was

found that the unlevel dyeing was due to oil emulsion which the mill had used for spraying the cotton in the blow-room. The necessary methods for removing the unlevel dyeing were suggested to the mill, and a formula for a spraying emulsion, which would not cause similar trouble in the dyeing of yarns, was also given in the report.

(8) A firm sent two samples of foreign cottons with a request that the percentage of dye absorption by these cottons for the given dye may be found at the Laboratory. These tests were made with the help of the sensitive photo-electric colorimeter designed at the Laboratory and a report was issued to the firm.

(9) A firm sent a bundle of unspun silk sample regarding which a dispute had arisen as to whether it had been previously hand-reeled or machine-reeled. The firm requested the Laboratory to carry out a reeling test on this sample in order to settle the point. A special reel was constructed at the Laboratory and the test, in which the number of actual breaks are counted when the sample is reeled at a constant speed, was carried out. A report containing the results of tests and the conclusions drawn from them was issued to the firm.

(10) A cotton mill sent two samples of cloth prepared from low Indian cottons which may be used for such non-textile purposes as substitute hessian cloth, flour-bags, etc. The analytical tests on these samples indicated that if the warp yarns used in one cloth and the weft yarns used in the other were combined to produce a new material, it would be superior to either in respect of its strength and durability. This suggestion was conveyed to the mill management, who kindly prepared the material according to this suggestion, and the tests made on this sample fulfilled the expectations. The possibilities of using this material, which possesses satisfactory strength in both warp and weft directions and is made from cheap Indian cottons, are being further explored.

(11) A cotton mill sent a small sample of ring frame tape for complete analysis. Tests were made not only on the actual counts of the single yarns from which this sample of tape was prepared, but also on the mean fibre-length and the fibre-weight per inch of the cotton used in manufacturing it. A report giving full particulars as to which type of cotton would be suitable for manufacturing the tape was issued to the mill.

III. RESEARCH LABORATORY.

Fibre Testing Section.

This Section was kept fully occupied during the period under review with the tests on small size samples received for fibre tests only or on medium

size samples on which complete tests were made. In addition to the latter samples of which a full statement has already been given, fibre tests have been made on 165 small size samples, raising the total number of samples tested in this Section during the period under review to 657. Statement D gives the details of the small size samples on which fibre tests were made :

STATEMENT D.

1. *The East India Cotton Association Ltd., Bombay.*—4 samples of cottons.
2. *A Mill, Bombay.*—2 samples of cottons.
3. *A Mill, Bombay.*—6 samples of Egyptian cottons.
4. *Economic Botanist to Government, U. P., Cawnpore.*—25 samples of cottons.
5. *A Firm, Bombay.*—1 sample of Hubli Jayawant cotton.
6. *The Economic Botanist, Department of Agriculture, Bangalore.*—1 sample of H. 190.
7. *A Mill, Bombay.*—4 samples of cottons.
8. *The Assistant Cotton Breeder, Agricultural Experiment Station, Amreli* —49 samples.
9. *A Firm, Bombay.*—6 samples of African and Sind American cottons.
10. *A Mill, Bombay.*—1 sample of Gaorani cotton.
11. *The Director, Institute of Plant Industry, Indore.*—5 samples of Dhar, etc.
12. *A Firm, Bombay.*—40 samples of Egyptian and other cottons.
13. *The Ceylon Trade Commissioner, Bombay.*—4 samples of Cambodia and other cottons.
14. *A Mill, Ahmedabad.*—3 samples.
15. *The Cotton Breeder, South Gujerat, Surat.*—7 samples of strains.
16. *The Cotton Research Officer, Rangmati, Chittagong Hill Tracts.*—3 samples of cotton.
17. *The Agricultural Commissioner to the Government of India, Delhi.*— 4 samples.

Many of these tests were of a routine character, but some samples possessed interesting features and are worthy of special mention. These are as follows :—

(1) *Herbaceum cotton in Baluchistan.*—Some time back a survey was conducted in Mekran and Baluchistan by a member of the staff of the Institute of Plant Industry, Indore. A sample of cotton collected in this survey was sent to the Laboratory for tests. It was found that this particular sample from Baluchistan belongs to an inferior class of *Herbaceum* cotton as compared with the sample from Iran which was collected in a previous survey and tested at the Laboratory.

(2) *Samples from Afghanistan.*—Two samples of cotton lint, 2 samples of kapas, one sample of yarn and 4 samples of cloth were received for tests from the Imperial Mycologist, New Delhi, under instructions from the Agricultural Commissioner with the Government of India. These samples had been obtained from Afghanistan. The samples of cloth and yarn were much too small for any detailed tests, but fibre tests were made on samples of lint and kapas.

(3) *Amreli samples.*—Last year 15 samples belonging to promising strains of Mathio cotton were received for tests in connection with the scheme for improvement of this cotton, especially with regard to its leafiness. Unfortunately, as the season was very unfavourable, the weights of the samples received were too small for trash determination tests. Therefore, only fibre tests were made on these samples and a report was issued to the officer concerned. This year, nearly 50 samples have been received in connection with this scheme. Of these 15 samples were sufficient in size for the trash determination tests and a report on them has already been issued. The remaining samples will be tested for fibre properties only.

(4) *Ceylon cottons.*—Two samples of Cambodia and two samples of Uganda cottons raised in Ceylon were received through the Ceylon Trade Commissioner for India, Bombay, for tests. A report containing the results of these tests was issued to the officer concerned.

(5) *Bengal cottons.*—Three samples of cotton were received from the Cotton Research Officer, Rangmati, Chittagong Hill Tracts, Bengal. They were reported to be sown in May and harvested in December and during this period they received a heavy rainfall of about 100 inches. Their ginning percentage lay in the neighbourhood of 43 per cent. while in respect of their length and fibre-weight per inch they resemble the Garo Hill cotton of Assam to which a reference has been made above. In view of their exceptionally coarse feel, the percentage of wax associated with each sample was also determined and a detailed report was issued from the Laboratory.

PHYSICS SECTION.

Mr. N. Hari Rao.—Mr. N. Hari Rao continued to supervise the work of the Fibre Testing Section during the period under review. In addition, he

continued with his investigation on the detailed examination of those Indian cottons which were found to give abnormal spinning performance. He tested five more cottons in this connection, bringing the total number of cottons examined by him for purposes of this investigation to 30. The results obtained were analysed, and they show that swollen hair diameter, standard hair weight and fibre-length irregularity play important parts in accounting for the abnormal behaviour of these cottons ; the fineness of the fibre playing a decisive part in some cases. Equations connecting the spinning value and the fibre properties, including those mentioned above, were worked out for these cottons, and a paper containing the tentative conclusions drawn from this study was read at the last session of the Indian Science Congress. The investigation was continued by studying some of the typical Indian cottons. For this purpose, the swollen hair diameters of the standard cottons and others were measured, and the fibre properties of the agricultural samples received and tested in the last year were analysed. This work is in progress.

In addition to this work, Mr. Hari Rao helped in training Messrs. S. M. Nawaz and Sassoon Samson, Technological Assistants respectively at Sakrand and Cawnpore, in statistics and the application of statistical methods to cotton technology. He also trained Mr. A. K. Deshpande who was sent to the Laboratory by Mr. Bruen, Livestock Expert to the Government of Bombay, with samples of wool for the necessary tests and interpretation of test data.

Mr. R. S. Koshal.—The investigation on the effect of different speeds of beater and fan in the Crighton opener and the number of passages in this machine on the fibre properties and the spinning performance of Indian cottons, to which a reference has been made above, was continued. During the period under review all the tests for estimating the mechanical damage to fibres drawn from samples subjected to different treatments in the Crighton opener were completed for Bengals cotton. The tests on P.A. 289F were then undertaken and fibre tests and Shirley Analyser tests on all the samples of this cotton, yarn tests and tests for estimating the mechanical damage to its fibres have nearly been completed. Analysis of the fibre length results of P. A. 289F has indicated that all the samples receiving the blow-room treatment possess slightly lower mean length as compared with the raw cotton, but that there is practically no difference between the various samples subjected to different treatments in the Crighton opener. This result applies only to the fibre-length tests and analysis of the yarn strength and other test results is in progress.

Mr. C. Nanjundayya.—Mr. Nanjundayya continued with his investigation on the effect of storage on the quality of Indian cottons. During the period under review measurements were completed as regards fibre-strength, yarn strength, change in colour and copper number on the samples obtained from the 3rd and 4th drawings. The samples from the 5th and the final drawing were also taken out and the necessary tests were commenced on them during this period. When all the tests are completed, they will be analysed and the results will be written up in the form of a bulletin.

In the course of this investigation it was observed that the copper number of the samples drawn immediately after the monsoon was somewhat higher than that of the samples drawn in the dry season. This point is being further investigated.

Sometime back the writer and Mr. Nanjundayya had designed a Laboratory device for maintaining automatically constant humidity in a closed chamber. This device has been used successfully in the Laboratory in some of the investigations, and it was felt that the salient features of this device may be brought to the notice of other research workers. Accordingly, a short paper giving an account of this device was written up and read at the last session of the Indian Science Congress. Mr. Nanjundayya, furthermore, assisted me in preparing the draft of a paper on another device which has been designed at the Laboratory with the object of recording automatically the changes in the moisture content of hygroscopic materials. This paper was also read at the last session of the Indian Science Congress.

Mr. Srinagabhushana.—Mr. Srinagabhushana continued with his investigation on the spinning quality of mixtures prepared from Indian cottons and staple fibres and the determination of the optimum conditions for the processing of these mixtures. The mixtures were prepared in four different proportions from three Indian cottons, namely, Jayawant, Cambodia Co. 2 and 1027 A.L.F., and a staple fibre 1″ long and 1.5 denier filament. These were spun with five different twists and three drafts, and the yarns obtained from them were tested for wet and dry strength and ballistic work of rupture. Furthermore, in view of the fact that sufficient data for applying the necessary corrections to the strength of yarns spun from staple fibre and its mixtures and tested under different humidities is not available, single-thread strength tests were made on these yarns to obtain the necessary correction factors. These tests are now nearing completion and a bulletin will be issued in due course.

CHEMISTRY SECTION.—

Mr. D. L. Sen.—It has been decided that a brochure should be prepared for the benefit of the cotton breeders, the practical carders and spinners and others interested in Indian cottons, explaining the relative significance of the various fibre properties including, the wax content, in determining the spinning quality of Indian cottons. During the period under review, Mr. D. L. Sen completed the determination of the wax content of all the standard Indian cottons of the 1937-38 and 1938-39 seasons in connection with this brochure, which is now under preparation. While carrying out these tests, it was noted that the method of cleaning cottons by hand was extremely laborious. It was felt that if the cottons could be cleaned in a satisfactory way with the Shirley Analyser, it would effect a considerable saving in time. Accordingly, tests were made with three standard Indian cottons to assess the validity of using this method of cleaning. However, it was found that the cotton cleaned

by the Shirley Analyser gave somewhat lower values of wax content than their samples cleaned by hand. Accordingly, it was decided not to use the Shirley Analyser for this particular test.

In view of the fact that several mills had sent samples of their cottons for dye absorption tests, it was felt necessary to work out a technique which would give the optimum difference in the absorption of two or three typical dyes by different Indian cottons. Accordingly, a series of tests were made by Mr. Sen with three standard Indian cottons namely, Surat 1027 A.L.F., Mollisoni and Cambodia Co.2, using three concentrations of two direct dyes with two different concentrations of Glauber's salt. The particular concentrations of dye and Glauber's salt, which would show the maximum difference, were thus worked out for guidance.

Arising out of the suggestion that the non-textile uses for which Indian cottons, specially the medium and low qualities are suited should be fully explored, Mr. Sen prepared the draft of a note on the alternative uses of cotton which, in its final form, was considered at the last meeting of the Indian Central Cotton Committee. The suggestions contained in this note have led to the exploration of a number of possible channels such as the substitute hessian cloth, cotton belting, artificial leather, cotton cloth for road construction, cotton bags for sugar, flour, cereals, etc. These are being followed up and preliminary work in connection with some of them has been done.

It was decided at the last meeting of the Committee that sufficiently large quantities of absorbent cotton should be prepared at the Laboratory using the two different conditions of treatments which were found to give the best results, and that samples should be sent to various hospitals in British India for trial and report. Accordingly, 9 lbs., of absorbent cotton were prepared and despatched to several hospitals.

In addition to these tests, Mr. Sen helped me in making several special tests in connection with the work of the Testing House, such as the investigation of the causes of stains on cloth and methods for their removal, investigation of the unlevel dyeing of certain yarns and the causes responsible for them, etc.

WORK ON INDIAN LINTERS.—

Dr. Lavji Thoria.—On rejoining the Laboratory, Dr. Thoria commenced work on the 15 samples of linters of the 1938-39 crop which had been collected from the different oil mills and delinting factories. These samples were subjected both to mechanical and chemical analysis with the two-fold object of (1) properly grading such Indian linters as were available in the market and (2) correlating the results of the two series of tests. The mechanical analysis

was carried out in the Shirley Analyser, while the chemical treatment was given in a small autoclave followed by bleaching. Furthermore, the alpha-cellulose content and ash percentage of the chemical cotton, obtained as a result of the latter treatment, were also determined.

It was found that a very large portion of the foreign matter present in the linters could be removed by two passages in the Shirley Analyser, but that some of the very short fibres mostly motes and matted hairs, were also extracted in this process. The proportion of the total trash in the 1938-39 samples varied from 12.5% to 47.5% while the invisible loss, which included the very short fibres referred to above varied from 7.5% to 22.5%. The higher limits of these losses give an idea of the large amount of trash which was found to be present in some of the linter samples. The chemical treatment, though more time-absorbing, has the advantage that none of the fibres is extracted in this process, which removes only the foreign matter associated with a sample. The percentage of chemical cotton obtained from the linters was found to range from 46 to 78, while its alpha-cellulose content lay between 85% and 99% and the ash content between 0.07% and 2.12%. Since any sample of chemical cotton which contains more than 0.12% ash content and less than 98% alpha-cellulose is generally regarded unsuitable for the manufacture of rayon, the figures given above show clearly that, in the absence of any suitable grades, the linters produced in India in 1938-39 varied widely in respect of their quality and that some of them at least were uneconomical for the manufacture of rayon. As regards the two series of tests, a fairly high correlation coefficient was found to exist between the results of mechanical and chemical analyses, but in view of the variable invisible loss in the former, owing to the removal of some of the very short hairs present in a sample, there were certain anomalous cases.

In view of the exceptionally high ash content of some of the samples of chemical cotton prepared from these linters, the ash content of the linters was also determined and was found to range from 2% to 11.3%. A visual examination of the composition of the trash associated with some of the dirtiest samples revealed the existence of fine particles of sand, dirt, seed-coat bits, etc., which are extremely difficult to remove in the cleaning process and which are instrumental in pulling down the quality of the chemical cotton.

From the current year's crop 23 samples of linters had been obtained from various oil mills and factories and these were subjected to the Shirley Analyser treatment, while their chemical analysis is in progress. It may be mentioned here that, as compared with the previous year, considerable improvement is noticeable in the quality of linters produced in India. This will be seen from the following table, which gives the minimum and maximum percentages of fibres, trash and invisible loss in the samples of the two seasons.

TABLE

No.	Linters of the season.	% Fibres.		% Trash.		% Invisible loss.	
		Min.	Max.	Min.	Max.	Min.	Max.
1	1938-39 ..	37.5	80.0	12.5	47.5	7.5	22.5
2	1939-40 ..	67.0	90.0	5.2	25.6	3.6	15.4

During the year under review the American official standard grades—seven in all—were received in the Laboratory and arrangements were made with the East India Cotton Association for the grading of the two seasons' samples of Indian linters against these official U. S. A. standards. In this connection my best thanks are due to Mr. R. G. Saraiya and Mr. F. Nanavati (of the East India Cotton Association) who very kindly helped me in the grading of these samples.

In addition to this work, an investigation has been undertaken with a view to finding out the optimum processing conditions which would give the best quality products involving the minimum degree of degradation of cellulosic material. For this purpose, some of the selected samples of linters were given three different treatments in a circulation kier with varying amounts of caustic soda under 25 lbs. pressure. One of the samples thus obtained was given different bleaching treatments, varying the hydrogen ion concentration. Five different values of pH were selected for this purpose from the electrometric titration curve. The quality of the bleached samples is proposed to be assessed by (1) chlorine consumption, (2) solubility in dilute alkali, (3) whiteness and (4) cuprammonium fluidity. Tests in connection with (1) and (2) have been completed while those under (3) and (4) are in progress.

MICROSCOPY SECTION.

Mr. A. N. Gulati.—Mr. Gulati continued his investigation on the deterioration of B. D. 8 and Broach Palej cottons stored at different relative humidities. It was found that contrary to common belief, storage at as high a humidity as 90% R. H. did not lead to any appreciable deterioration in fibre strength in over a year provided the cotton was kept in an uniformly humid temperature. During this period, however, a small falling off in the lustre of cotton was noticed. In order to study this point further, the effect of localised watering in small areas prior to the storage of cotton at different humidities, was investigated. It was found that, with localised watering even by a small amount, deterioration was visible in only three weeks' time, even though the samples were stored in a dry condition over calcium chloride. If, in addition, the samples were stored under moderately damp or humid conditions, corresponding to relative humidities of 60% and 90% R. H., the deterioration was even more pronounced. These results brought out,

on the one hand, the deleterious effects of localised watering such as may result from spraying of cotton, even when the conditions of subsequent storage may be quite satisfactory, and, on the other hand, they showed that if localised watering is not resorted to, the cotton may be stored in a fairly humid atmosphere for moderately long periods of time without showing much falling off in fibre-strength.

Furthermore, a sterilised sample of cotton was stored over saturated humidity for more than five months and it was found that no loss in fibre-strength took place in this period. If the sample of cotton had not been sterilised, the strength would have been reduced to a half in a few weeks' time. These experiments bring out the enormous part played by fungi and bacteria in the deterioration of stored cottons and the assistance given to them by localised watering.

In addition to this work, Mr. Gulati prepared during the period under review two papers, one entitled "Silverfish Insect, An Enemy of Viscose Fabrics and Yarns" and the other entitled "The effect of environment on fibre-maturity." These papers were read at the last session of the Indian Science Congress.

IV. MOISTURE TESTING SECTION.

During the year under review tests for the determination of moisture content were made on 85 samples, which fall under the following classifications :—

Technological samples	23
Trade samples	62

The technological samples referred to above are those which were tested in connection with the various investigations carried out at the Technological Laboratory, while the trade samples are those which were sent by various firms and mills for moisture determination tests. Since the commencement of this Section upto 31st May 1940, 1156 samples have been tested in this Section.

V. PUBLICATIONS.

The following publications were issued from the Laboratory during the period under review :—

I. *Technological Bulletins, Series A, Nos.* 48, 49 *&* 50.

(1) Technological Bulletin, Series A, No. 48, "Empirical Relationships between Count, Twist and Strength of Cotton Yarns: Part I. Count-Single Thread Strength, Part II. Twist-Strength", by Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F.Inst.P., and V. Venkataraman, M.A.

(2) Technological Bulletin, Series A, No. 49, "Technological Reports on Standard Indian Cottons, 1939" by Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F.Inst.P.

(3) Technological Bulletin, Series A, No. 50, "Technological Reports on Trade Varieties of Indian Cottons, 1939" by Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F.Inst.P.

II. *Technological Bulletins, Series B, Nos.* 28 *and* 29.

(1) Technological Bulletin, Series B, No. 28, "A Study of Inheritance of mean fibre-length, fibre-weight per unit length and fibre-maturity of Cotton" by R. S. Koshal, M.Sc., A. N. Gulati, M.Sc., and Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F.Inst.P.

(2) Technological Bulletin, Series B, No. 29, "The Chemical Processing of Indian Cotton Materials, Part I.—Determination of the optimum conditions of Kier Boiling and Bleaching of four good quality Indian Cottons" by Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F.Inst.P., M. U. Parmar, M.Sc., and K. Venkataraman, D.Sc., F.I.C., A.M.I. Chem. E.

III. Technological Circulars:

Technological Circular Nos. 403 to 439 inclusive as under :—

Circular No.	Title.	Date of publication.
403	Technological Report on Jayawant (Kumpta), 1938-39 ..	June 1939.
404	Spinning Test Report No. 1087 on samples of Westerns Cotton, 1938-39	,, ,,
405	Technological Report on Punjab American 4F, 1938-39 ..	,, ,,
406	Technological Report on Punjab American 289F, 1938-39..	,, ,,
407	Spinning Test Report No. 1100 on samples of Kadi Viramgam cotton, 1938-39	Aug. 1939.
408	Spinning Test Report No. 1101 on samples of Farm Westerns cotton, 1938-39	,, ,,
409	Spinning Test Report No. 1102 on samples of Upland cotton, 1938-39	,, ,,
410	Spinning Test Report No. 1103 on samples of Bijapur cotton, 1938-39	,, ,,
411	Spinning Test Report No. 1106 on samples of Jayawant cotton, 1938-39	,, ,,
412	Spinning Test Report No. 1109 on samples of A. R. Busoga cotton, 1938-39	,, ,,
413	Spinning Test Report No. 1111 on samples of A. R. Jinja cotton, 1938-39	,, ,,
414	Spinning Test Report No. 1113 on samples of A. R. Kampala cotton, 1938-39	,, ,,
415	Spinning Test Report No. 1168 on samples of Berar cotton, 1939-40	Mar. 1940.
416	Spinning Test Report No. 1169 on samples of C. P. No. 1 cotton, 1939-40	,, ,,
417	Spinning Test Report No. 1171 on samples of P. A. 289F, 1939-40	,, ,,
418	Spinning Test Report No. 1172 on samples of Latur cotton, 1939-40	,, ,,
419	Spinning Test Report No. 1173 on samples of Jagadia cotton, 1939-40	,, ,,
420	Spinning Test Report No. 1174 on samples of Broach cotton, 1939-40	April 1940.

Circular No.	Title.	Date of publication.
421	Spinning Test Report No. 1175 on samples of P. A. 4F cotton, 1939-40	April 1940.
422	Spinning Test Report No. 1176 on samples of Sind-Sudhar Cotton, 1939-40	,, ,,
423	Spinning Test Report No. 1178 on samples of Khandesh Cotton, 1939-40	,, ,,
424	Spinning Test Report No. 1180 on samples of Surat Cotton, 1939-40	,, ,,
425	Spinning Test Report No. 1181 on samples of Navsari Cotton, 1939-40	,, ,,
426	Spinning Test Report No. 1182 on samples of Ujjain Cotton, 1939-40	,, ,,
427	Technological Report on Verum 262 (Nagpur) Cotton 1939-40	,, ,,
428	Spinning Test Report No. 1185 on samples of Miraj Cotton, 1939-40	,, ,,
429	Spinning Test Report No. 1186 on samples of Westerns Cotton, 1939-40	May 1940.
430	Technological Report on Late Verum (Nagpur), 1939-40 ..	April 1940.
431	Technological Report on Umri Bani, 1939-40	,, ,,
432	Spinning Test Report No. 1188 on samples of Broach Cotton, 1939-40	May 1940.
433	Spinning Test Report No. 1189 on samples of L. S. S. Cotton, 1939-40	,, ,,
434	Spinning Test Report No. 1190 on samples of Tiruppur Cambodia Cotton, 1939-40	,, ,,
435	Spinning Test Report No. 1191 on samples of Bailhongal Cotton, 1939-40	,, ,,
436	Technological Report on Verum 262 (Akola), 1939-40 ..	,, ,,
437	Technological Report on V. 434 (Akola), 1939-40	,, ,,
438	Spinning Test Report No. 1195 on samples of Farm Western Cotton, 1939-40	,, ,,
439	Spinning Test Report No. 1196 on samples of Navsari Cotton, 1939-40	,, ,,

In addition, the following papers were contributed to be read at the last session of the Indian Science Congress held in Madras in the first week of January 1940 :—

(1) "Silverfish Insect, An Enemy of Viscose fabrics and yarns," by A. N. Gulati, M.Sc., and Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F.Inst.P.,

(2) "The Effect of Environment on the Fibre-Maturity of Cotton" by A. N. Gulati, M.Sc., and Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F.Inst.P.

(3) "A Laboratory Device for maintaining automatically constant humidity in a closed chamber" by C. Nanjundayya, M.Sc., and Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F.Inst.P.

(4) " An Examination of cottons giving abnormal spinning test results " by Harirao Navkal, M.Sc., and Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F.Inst.P.

(5) " An Automatic Device for Recording Moisture Content of Hygroscopic Materials " by Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F.Inst.P.

(6) " Studies in Kier Boiling " by Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F.Inst.P., M. U. Parmar, M.Sc., and K. Venkataraman, D.Sc., F.I.C., A.M.I. Chem. E.

In addition, two short notes, one on " Chemical Cotton " and the other on " Garo Hill Cotton," were written and published in the September 1939 issue of the " Current Science."

Summaries of the Technological Bulletins, Series A, No. 48 and Series B, Nos. 28 and 29, and of the papers contributed to the Science Congress are given below :—

Technological Bulletin, Series A, No. 48, " *Empirical Relationships between Count, Twist and Strength of Cotton Yarns.*"—This bulletin is divided into two parts. In Part I, a formula has been developed by analysing the results of a very large number of single thread strength values. This formula which enables us to calculate the single-thread strength S_2 of any count C_2 (which is not spun) from the known strength S_1 of a count C_1 into which an Indian cotton has been spun is as follows :—

$$S_2 = \frac{C_1 S_1 - (C_2 - C_1) K}{C_2}$$

where K has approximately the value of 2·5, though its exact value can also be determined. For all practical purposes, the approximate value is sufficiently accurate.

This analysis follows on the earlier analysis in which a similar formula was developed for the lea strength of yarns spun from Indian cottons. The limitations of the present formula are discussed, and its special features are compared with those of the formula obtained for lea strength.

In Part II, the influence of twist on yarn-strength in order to find the optimum twist-multiplier which would give the maximum strength of yarns has been studied in some detail. The cottons selected for this purpose were P.A. 4F, Superfine Oomra, Wagad 8, A. R. Kampala, A. R. Busoga, A. R. Jinja, Egyptian Giza 7 and Sind Sea Island. These covered a wide range of staple length from the short stapled Oomras to the long stapled Sind Sea Island. The long stapled cottons were spun both into carded and combed yarns, while the short-medium staple cottons were also spun into different

counts with the same number of turns per inch in order to estimate the slippage factor. The following conclusions are drawn from the results of the numerous tests carried out on these yarns :—

(1) *Yarn breakages.*—The number of yarn breakages in the ring frame decreased in general as the twist multiplier was increased. This effect was more pronounced with the shorter than with the longer cottons, and became quite inconspicuous in counts much higher than the spinning capacity of a cotton.

For Wagad 8 a twist multiplier of about $4\frac{1}{2}$ and for the long stapled cottons a twist multiplier of about $3\frac{1}{2}$ may be regarded as suitable from the point of breakages in the ring frame. The optimum twist multiplier required to give a satisfactorily low number of breakages decreases as we proceed from the short to the long stapled cottons.

(2) *Yarn evenness.*—The optimum twist multiplier from the point of yarn evenness appears to be about 5 for Wagad 8 and $4\frac{1}{2}$ for P.A. 4F. It would thus appear that a coarser cotton, having the same mean length as a finer cotton, would require a higher twist multiplier to yield yarns of the same evenness class.

The use of a high twist multiplier in the P.A. 4F yarns either failed to effect any improvement in evenness or even had a deleterious effect. On the other hand, Superfine Oomra gave yarns of equal evenness class with different twist multipliers in 8's, 10's and 12's counts. In still higher counts, the yarns became uneven and the insertion of higher twist, even though it increased their strength, could not improve their evenness class.

For the African cottons, the yarns spun with the twist multiplier 4 were somewhat more even than those obtained with the two lower twist multipliers, while the two long staple cottons gave equally even yarns in each count irrespective of the twist multiplier within the range of 3-4. This feature held both for the carded and the combed yarns.

(3) *Lea strength.*—(*i*) *Short-medium staple cottons* (P.A. 4F, Superfine Oomra and Wagad 8). A twist multiplier of $4\frac{1}{4}$ or $4\frac{1}{2}$ is found to yield optimum strength in 20's counts spun from P.A. 4F, while in the higher counts of 30's and 36's the insertion of higher twist does not give adequate strength. For Superfine Oomra, a twist multiplier of $4\frac{1}{2}$ was found suitable for spinning it into 10's counts, a twist multiplier of 5 was necessary for 12's counts, while higher counts of 14's and 16's were found to be beyond its spinning capacity, and higher twist multipliers failed to impart adequate strength. It was further found that a coarse cotton required a higher twist multiplier to attain its peak lea strength, in any count, than a relatively fine cotton.

From the single thread data, the effect of fibre slippage as distinct from fibre rupture, has been calculated. It is demonstrated that the force required to pull apart the slipping fibres is directly proportional to the number of fibres

in the cross-section. It is further found that the value of the binding force on a single fibre in the yarn is several times greater than its clinging power, the ratio being higher for the coarser than for the finer cottons. The value of this factor for two cottons has been calculated from the results of these tests.

(*ii*) *Medium long staple cottons.* (A. R. Kampala, A. R. Busoga, A. R. Jinja). For these cottons a twist multiplier of 4 gave the best results in 40's counts, but as the difference in strength between these and the yarns spun with lower twist multiplier of $3\frac{3}{4}$ was small, other factors such as the appearance, feel, production of yarn, etc., may be taken into account in deciding the suitable twist multiplier.

(*iii*) *Long staple cottons.* (Egyptian Giza 7, Sind Sea Island). The effect of twist in increasing yarn strength was more marked with the coarser than with the finer of these two cottons.

The peak values of yarn strength were obtained with twist multiplier of $3\frac{3}{4}$ beyond which a small decrease was observed in most cases. However, the difference between these values and those obtained with the lower twist multiplier of $3\frac{1}{2}$ was very small.

4. *Single thread strength.* The single thread tests generally confirmed the conclusions obtained from the lea tests. Where any interesting points of contrast were observed, these have been discussed.

5. *Ballistic work of rupture.* It was found that as compared with the lea test results the change in the ballistic work of rupture with different degrees of twist, the decrease in the ballistic work of rupture as we proceed from the lower to the higher counts, and the rate of change of the ballistic strength with twist-multiplier are all small. These notable differences in the behaviour of the two sets of results are most probably due to the fact that in the ballistic test, the effect of extension is integrated along with that of breaking strength, while in the lea test only the breaking force is measured.

6. *Twist to give maximum yarn-strength.* The twist multiplier corresponding to the optimum strength is shown to be a function of at least fibre-length and fibre-weight per inch, though it is highly probable that other fibre-properties such as clinging power, wax content, etc., also have a bearing on it. In view of the practical importance of such twist-multipliers, their values, calculated to a first approximation from the results of these tests, are given together with a graph.

Technological Bulletin, Series B, No. 28.—"*A Study of the Inheritance of Mean Fibre-Length, Fibre-weight per unit length and fibre maturity of cotton.*"—This paper describes the results of an investigation underaken with the object of studying the inheritance of three fibre properties, namely, mean fibre-length, fibre-weight per unit length and fibre maturity which are known to have a considerable effect on the quality of yarn spun from a cotton. The tests were made on samples of 3 parent strains, namely, Cawnpore C. 520, Bani and Malvi and their F1s grown in a randomised block experiment in the same year at the Institute of Plant Industry, Indore.

From the preliminary analysis of variance it is found that the major portion of the observed variation is due to varieties and is of genetical nature, the variance due to blocks being small and non-significant. In order to study this genetical variation in greater detail, the variance for varieties were split up into three parts representing (1) Genetic (2) Epistacy and (3) Heterosis. Further analysis showed that for fibre-weight per unit length, greater part of the variation is of genetic origin, the effect of other two factors, Epistacy and Heterosis, being non-significant. For fibre-maturity and fibre-length, however, heterosis, in addition to genetic comparisons, is also found to be significant, showing that the hybrids possess the tendency to produce, on the average, larger number of mature and longer fibres than the parent strains. Further study of heterosis indicated that the cross Cwn. 520 x Bani gave significantly higher maturity than the mean of the parents, while in the other two crosses, although the maturity values were higher than the mean of the two parents, the differences were not significant. As against it, all the hybrids showed that there is evidence of the existence of heterosis in fibre-length, for each one of them gave significantly higher mean fibre-length than the mean of the two parents.

In order to find out which variety gives the best results on crossing, a comparison study was made for the parents and their first cross progenies. If, A, B and C represent a set of genes, characteristic of the parent strains, in respect of any one fibre character, the expression (2AA+AB+AC)—(2BB+BC+AB) would enable us to say whether or not A is better than B. On applying this method to the three fibre-properties it was found that Bani gave significantly higher fibre-length and fibre maturity, and lower fibre-weight than the other two varieties. Among the two crosses of Bani, the one with Malvi is longer and finer than that with Cwn. 520. It is suggested that Bani should be crossed with other suitable varieties to find out where the shuffling of useful characters occurs to the best advantage for the improvement of quality.

By the application of analysis of co-variance two interesting correlations, which confirm the previous investigations were drawn :—

(1) Correlation between fibre-maturity and fibre-weight.—The correlations for plants within the same plot is positive and significant, indicating that regardless of any variety, mature fibres are generally coarser.

(2) Correlation between fibre-length and fibre-weight per unit length :—The correlation for varieties is negative and significant, but for plants within the same plot, it is non-significant. This shows that fibres of longer length of all cottons do not generally give less fibre-weight per inch, indicating that a differential response may exist among varieties in this respect.

Technological Bulletin, Series B, No. 29, "The Chemical Processing of Indian Cotton materials, Part I—Determination of the optimum conditions of kier soiling and bleaching of four good quality Indian cottons."—Four Indian cottons, Jayawant, Cambodia Co.2, Surat 1027 A.L.F. and P.A. 289F were spun into 24's counts with moderate twist. The yarns were given 7 different kier boil treatments and one of the kier boiled samples was given 3 different bleach treatments. The 10 samples of yarns thus obtained were tested for lea strength, single-thread strength and cuprammonium fluidity. These tests, which are discussed in detail in the paper, have yielded some very interesting results. It has been found that kier boil with 3% NaOH, 1% wetting agent, 1% sodium silicate and 5% emulsion gave uniformly the best results, while the other treatments showed interesting difference among themselves. It was also observed that kier boil with 4% soda ash and 1% soap, which would ordinarily be regarded as a mild treatment, gave, on the whole, the worst results. The probable causes for this anomaly are discussed in the paper.

The cottons showed differential response with regard to the different treatments, which brought out the desirability of testing a cotton in order to ascertain accurately the optimum conditions of treatment for it. While the strength and the fluidity tests ran parallel in some cases, in others they showed interesting divergences which are discussed in the paper.

It was found that whereas the differences in the tensile strength between the bleached and unbleached samples were not significant, bleaching caused considerable rise in fluidity without a corresponding decrease in tensile strength.

The variation in actual counts as a result of the removal of the foreign matter from the yarns was also studied and is discussed in the paper.

Paper entitled "Silverfish Insect, an enemy of Viscose Fabrics and yarns."—A species of silverfish insect found in large numbers in a Textile mill godown was studied at the Cotton Laboratory, Matunga, for its propensities to damage textile fabrics. It was found that it nibbled and consumed viscose fibres vigorously both from cloth and yarn, while cotton fabrics were comparatively safe from its attack for short periods at least.

It was further observed that these insects ate greedily fungal growths from pieces of bread rather than bread itself. Hitherto they are known to live on starch and sugar.

"Allen's Killer" and Katol powder dustings at night were found quite efficient to kill large numbers of them on daily application.

Packing fabrics in insect-proof paper like "Veritas Superfine Kraft Union paper, or Hessian Duplex coated water-proof packing paper was also found effective in protecting the fabrics from these insects.

Paper entitled "The Effect of Environment on the Fibre Maturity of Cotton."— In continuation of the paper read at the last session of the Science Congress on the same subject, results of further experiments are reported in this paper. The material dealt with consisted of 72 samples of Cambodia cotton grown in two Rajputana States, namely, Bundi and Ajmere, under the supervision of the Institute of Plant Industry, Indore. The agronomical factors studied were (1) three sowing dates, in March, May and July; (*ii*) heavy and light irrigations; (*iii*) presence and absence of basal dressing of manure, and (iv) three top dressings of manure.

The following conclusions were drawn:

(1) Localities yield significantly different maturity percentages, Ajmere being better than Bundi.

(2) *Sowing Dates*:—The earlier the sowing date the better the maturity of Cambodia cotton in both localities, March sowing proving most beneficial and July sowing the least in this respect.

(3) *Irrigations*:—Adequate irrigation yielded higher fibre-maturity than light irrigation.

(4) *Basal Dressing of manure*:—The application of sheep dung manure at the rate of 32 maunds per acre plus Ammonium sulphate, 50 lbs. per acre as basal dressing, tended to yield poorer maturity than no basal dressing.

(5) *Top Dressings*:—Top dressings with sheep-dung alone and sheep-dung with ammonium sulphate as compared to no top dressing yielded better maturity percentages. Sheep-dung plus ammonium sulphate was even better than sheep-dung alone in its effect.

It is suggested that the effect of other manures in top and basal dressings should also be studied as it promises to be an avenue of improvement of the fibre-maturity of cotton.

Paper entitled "A Laboratory Device for Maintaining Automatically Constant Humidity in a Closed Chamber."—Many substances are hygroscopic and their properties are modified considerably by the prevailing humidity. Among these textiles, paper, tobacco, food-stuffs, etc., occupy important positions. Reliable data can only be obtained when the tests on these substances are carried out under known conditions of humidity and temperature, the former being more important for textiles. There are several devices for controlling humidity in a room or a small chamber some of which are either expensive or very elaborate. The present apparatus can be easily constructed in a laboratory at a low cost and has been found quite efficient for maintaining any desired humidity over a fairly wide range in a chamber for long periods of time.

The chamber consists of a water-proof box, into which a glass jet introduces dry steam, which in turn is generated by electrically heating water in a flask. A thermo-hygrograph acts as a control of humidity and operates a relay, which makes or breaks the current in the heating coil circuit. A few dishes of granulated calcium chloride are kept at one end of the chamber so as to provide a check on the variations of humidity. A small fan, placed in front of a gauze screen, serves to keep the air inside the chamber in circulation without disturbing the material under test.

Paper entitled "Examination of cottons giving abnormal spinning test results."—It is agreed that the best method of judging the quality of a cotton is by spinning it under standard conditions. It is, however, not always possible to do so especially if the samples are small or a spinning plant is not readily available. Fibre tests, however, can be made on small samples, and can give very valuable information both to the cotton breeders and millowners regarding the spinning quality of their cottons provided the latter can be closely correlated with fibre-properties. Such regression equations for Indian cottons have been worked out at the Technological Laboratory by Turner, Ahmad and Venkataraman.

On testing these formulæ it is found that the predicted and the actual spinning values agree in a large number of cases, but in a few cases the discrepancy between them is quite large. Some of the cottons showing these discrepancies have been selected for detailed examination of their fibre-properties, including maturity, strength, swollen diameter, etc., the objects of these tests being to find out the precise part played by each of these properties in determining the spinning quality of these cottons and whether or not the prediction formulæ can be modified so as to remove the observed discrepancies. The investigation has shown that swollen diameter, standard hair weight, fibre-length irregularity and intrinsic strength are all important in these abnormal cases. It has further shown that though in general, mean fibre-length is the most important property for Indian cottons, within certain limited ranges of length, the fineness of cotton plays even more important part. It has further revealed that the association of fineness with strength may give the clue to the abnormal behaviour of certain cottons.

As a result of this work, which is in progress, even if it is not possible to modify the prediction formulæ so as to fit in all cases, it would be possible to estimate the relative importance of the various fibre properties and to emphasise those which may lead to a better understanding of the cottons showing abnormal behaviour in spinning.

Paper entitled "An Automatic Device for Recording the Moisture Content of Hygroscopic Materials."—It is sometimes necessary to study minutely the variations in the weight of a hygroscopic substance or to compare the behaviour of two such substances. For this purpose an apparatus was set up at the Technological Laboratory in which the material is kept in one arm of a balance which is suspended with a fine wire into a chamber in which variations of

humidity are brought about. A spiral spring serves to counterpoise the weight in the other arm, while a non-hygroscopic string tied to this arm and passing over a frictionless pulley is fastened to one end of a recording pen, which can oscillate freely in a vertical plane. The pen is kept close to a rotating drum, run by a clock work. A separate electric circuit containing a solenoid with a plunger and a time-piece, in which arrangement is made for hourly contact moves a small carriage on a horizontal glass plate. Every time the contact is made a vertical rod fixed to the small carriage presses the pen against the drum having a small dot. The friction of the pen against the drum is entirely eliminated and apparatus can be calibrated to give variations in the weight of the material, its rate of absorption or desorption, time of lag, time of attaining equilibrium, etc., can be worked out.

Some experimental results are given.

VI. GENERAL.

Visitors.—As usual, a large number of people connected with cotton trade and industry and others visited the Laboratory during the year under review. Among them mention may be made of the following :—

(1) The Senior Marketing Officer of the Indian Central Jute Committee, Calcutta.

(2) Cotton Price Adviser, Bombay.

(3) The Deputy Director General of Agriculture, Kabul, Afghanistan.

(4) The Chief Minister and Revenue and Financial Minister, Rampur State, Rampur.

(5) Dr. V. S. Dube of the Benares Hindu University.

(6) Students of the Sydenham College of Commerce, Bombay.

(7) Students of the Kanyakubja College, Lucknow, U. P.

(8) Students of the Allahabad Agricultural Institute, Allahabad.

(9) Students of the Agricultural Institute, Baroda.

(10) Students of the Government Central Textile Institute, Cawnpore.

(11) Students of the Foreman Christian College, Lahore.

(12) Students of the University of Dacca, Dacca.

Equipment.—The following machinery and apparatus were added to the equipment of the Laboratory during the year under review :—

(1) One 2-Head New Model Nasmith Comber.

(2) One Goodbrand Vertical Yarn and Cloth Strength Tester reading upto 250 lbs.

(3) One Leeds and Northrup Galvanometer.

(4) One Stroboscope with counting device.

(5) Extra gearing arrangements for the slubbing, inter and roving frames.

Note on item No. (5).—Each of these machines has now been split up into two sections, each section possessing its own gearing arrangement though both sections have a common drive. The settings in each section can be changed independently, while one of the sections is fitted with rollers of slightly lower diameter. These alterations have made the working of these machines far more satisfactory as one section is now reserved for the short cottons while the other half is used for the comparatively longer cottons. In view of the fact that the settings can be changed independently in each section, an appreciable amount of time is also saved in the processing of samples.

Ginning machinery.—The Indian Central Cotton Committee has already sanctioned a scheme for extension of the Laboratory so as to include a Ginnng Section in which the optimum conditions for the pre-cleaning and ginning of Indian cottons would be studied in detail. In connection with this Section, the following machinery has already been received :—

(1) One Cen-tennial 40 saws Experimental Saw Gin Unit complete with steel 4-drum Ball Bearing Cleaner Feeder, double drum steel battery condenser and blast fan.

(2) One improved Convertible Little F. E. C. extracting and cleaning machine.

(3) One Rotary Filer Gummer.

(4) One Volkart's New Patent Double Roller Gin.

(5) One Platt's Double Cylinder Seed Cotton Opener 50″ wide, with fan for updraught and delivery lattice.

(6) One Double Action Single Roller Macarthy Gin, 40″ wide.

(7) Three suitable Electric Motors for the above-mentioned machinery.

For various reasons some delay has taken place in putting up the building for this section, but as soon as the monsoon is over, the work will be started, and it is hoped that this Section will commence its operations with the arrival of the seed cotton from the new year's crop.

De-humidifying Equipment.—At its meeting held on the 12th July 1938 the Indian Central Cotton Committee sanctioned the installation of additional equipment at the Laboratory for maintaining throughout the year constant conditions of humidity and temperature in the spinning room and the yarn testing room. This equipment has now been installed at the Laboratory and a reference has already been made to it.

Boiler.—In view of the fact that the old boiler of the Laboratory was condemned by the Chief Inspector of Boilers and Smoke Nuisances, Bombay Province, a second-hand boiler was purchased and erected in the boiler room of the Laboratory.

Conference of Technological Assistants.—The Technological Assistants working in the mofussil laboratories attended the Laboratory in November-December 1939 for the ' refresher ' course and the conference of the Technological Assistants. This conference took place on the 1st and 2nd December 1939 and the subjects previously sent by all the Technological Assistants were discussed. A report of this conference has already been considered by the Committee.

Third Conference between the Practical Carders and Spinners and the senior members of the staff of the Laboratory—This conference took place on the 17th April 1940. The attendance on this occasion was not so good as on the previous occasion owing to various factors, but the subjects placed before the Conference were discussed in a thorough manner. A report of this conference forms a separate item on the agenda of the Committee.

Staff.—Full details of the Technical Staff employed at the Laboratory are given in Appendix III, while leave, transfers, appointments, etc., pertaining to the staff are mentioned below :—

Leave.—The writer proceeded on leave from the 2nd October 1939 to 18th November 1939. During this period Mr. D. L. Sen, Senior Research Assistant, acted as Officiating Director.

Dr. Lavji Thoria, Temporary Chemist, who had been transferred to the Industrial Research Bureau, New Delhi, rejoined the Laboratory on the 7th June 1939. He proceeded on leave from 20th February 1940 to 20th March 1940 and from 23rd May 1940 to 8th June 1940.

Mr. R. S. Koshal, Senior Research Assistant, proceeded on leave from the 6th May 1940 to 8th June 1940.

Mr. A. N. Gulati, Junior Research Assistant, proceeded on leave from the 6th May 1940 and is expected to return to duty on 27th July 1940.

Mr. C. Nanjundayya, Junior Research Assistant, proceeded on leave from 17th April 1940 to 25th May 1940.

Transfers and appointments.—Mr. K. S. Marar, Technological Assistant at Sakrand, reverted to the Laboratory at his own request, and the post vacated by him was filled up by the promotion of Mr. S. M. Nawaz, Junior Tester, who was relieved from the Laboratory on the afternoon of the 29th June 1939. He joined the post of Technological Assistant at Sakrand on the 3rd July 1939, relieving Mr. K. S. Marar, who proceeded on leave from the 4th July 1939 to 9th September 1939.

A new post of Technological Assistant at Cawnpore was created, and Mr. Sassoon Samson, B.Sc., LL.B., a Junior Tester at this Laboratory was appointed to this post. He was relieved from the Laboratory on the afternoon of the 22nd September 1939 and joined his post at Cawnpore on the 25th September 1939.

Mr. H. B. Joshi, Senior Tester in charge of the Yarn Testing Section, was promoted to the newly created post of Head Tester with effect from the 12th September 1939.

Mr. G. J. Kharkar, Junior Tester, was called for military duty from the 2nd to the 9th September 1939 and from 2nd January 1940 to 1st February 1940. He is again on military duty since the 29th February 1940.

Two new posts of Junior Testers were created to cope with the increased work in the Fibre and Yarn Testing Sections. Messrs. S. B. Mogre and P. D. Vakil, who were officiating Junior Testers since October 1938 were appointed to these posts. Messrs. C. A. S. Iyer and M. Bhaskerrao were appointed as officiating Junior Testers in place of Messrs. S. B. Mogre and P. D. Vakil. They joined the Laboratory on the 1st and 2nd May 1940 respectively.

Messrs. M. R. K. Murthy, B.Sc. (Tech.), J. S. Vilvalingam and H. B. Manghirmalani were selected for training in the elements of cotton technology and fibre and yarn testing. They joined the Laboratory on the 29th January 1940. Mr. Murthy was relieved at his own request on the 5th May 1940, while the other two students are continuing their training.

ACKNOWLEDGMENTS.

The work described in this report could not have been completed without the support and active interest of the Office-bearers and members of the Committee and the loyal co-operation of the staff of the Laboratory, and my best thanks are due to them all. I am also grateful to Mr. Varjivandas Motilal of Messrs. Narandas Rajaram & Co., Bombay, and Mr. Purshotamdas Harkisondas of Messrs. Bhaidas Cursondas & Co., Bombay, for their valuable assistance in grading the large number of samples tested at the Laboratory.

(Sd.) NAZIR AHMAD,
Director,
Technological Laboratory.

Dated the 28th June 1940.

APPENDIX III.

LIST OF SCIENTIFIC AND TECHNICAL STAFF OF THE TECHNOLOGICAL LABORATORY AS ON 31ST MAY 1940.

	Designation.	Name.	Remarks.
1.	Director	..Dr. Nazir Ahmad, O.B.E., Ph.D., F. Inst., P...	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga.
2.	Senior Research Assistant (Chemist)	..Mr. D. L. Sen, M.Sc., Tech. (Manch.), M.Sc., (Bom.), A.I.I.Sc., F.I.C.	Research Student of the Indian Institute of Science and Manchester College of Technology.
3.	Senior Research Assistant (Physicist) ..	Mr. N. Hari Rao, M.Sc. (Calcutta)	Research Scholar, Technological Laboratory (Textile Physics).
4.	Senior Research Assistant (Physicist) ..	Mr. R. S. Koshal, M.Sc. (Punjab)	Do. do.
5.	Spinning Master	Mr. V. V. Gupte, B.Sc., Tech. (Manchester) B.Sc. (Bombay).	....
6.	Junior Research Assistant	Mr. A. N. Gulati, M.Sc. (Punjab)	Imperial Institute of Veterinary Research, Mukteshwar, U.P.
7.	Statistician and Personal Assistant ..	Mr. V. Venkataraman, M.A. (Madras) ..	Statistical Assistant, Labour Office, Government of Bombay.
8.	Junior Research Assistant	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory (Textile Physics).
9.	Do.	Mr. Srinagabhushana, B.Sc.	..Research Scholar, Technological Laboratory and Technological Assistant, Surat.
10.	Temporary Chemist	Dr. L. Thoria, (Dr. Ing.)	....
11.	Head Tester	Mr. H. B. Joshi, B.Sc.	....
12.	Senior Tester	Mr. S. S. Sukthanker, L.T.C. (V.J.T.I.) ..	....
13.	Junior Tester	Mr. G. D. Bhide, B.Sc.	....

APPENDIX III.—*continued.*

LIST OF SCIENTIFIC AND TECHNICAL STAFF OF THE TECHNOLOGIGAL LABORATORY AS ON 31ST MAY 1940—*continued.*

	Designation.	Name.	Remarks.
14.	Junior Tester	Mr. K. V. N. Nayar	....
15.	Do.	Mr. V. N. Modak, B.Sc.	....
16.	Do.	Mr. L. V. Sundararaman, B.A.	....
17.	Do.	Mr. P. S. Sambamurthi	....
18.	Do.	Mr. R. G. Panvalkar, B.Sc.	....
19.	Do.	Mr. G. J. Kharkar, B.Sc.	....
20.	Do.	Mr. A. J. Farid	....
21.	Do.	Mr. P. V. Nachane, B.Sc.	....
22.	Do.	Mr. C. S. Ramanathan, B.Sc.	....
23.	Do.	Mr. B. N. Prabhakar, B.Sc.	....
24.	Do.	Mr. S. B. Mogre, M.Sc.	....
25.	Do.	Mr. P. D. Vakil	....
26.	Do.	Mr. C. A. S. Iyer	....
27.	Do.	Mr. M. Bhasker Rao, B.Sc.	....
28.	Statistical Clerk	Mr. R. Krishna Iyer	....
29.	Do.	Mr. P. K. Wagle	....
30.	Electrician	Mr. H. Lobo, L.E.E. (V.J.T.I.)	....
31.	Spinning Assistant	Mr. N. Iyengar	....
32.	Draughtsman	Mr. B. G. Mehta	....
33.	Mechanic	Mr. J. B. Kharas	....

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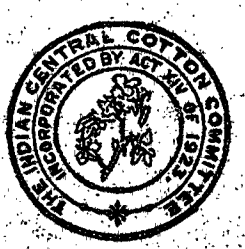

ANNUAL REPORT

OF THE

DIRECTOR

TECHNOLOGICAL LABORATORY

FOR THE

YEAR ENDING 31st MAY 1941

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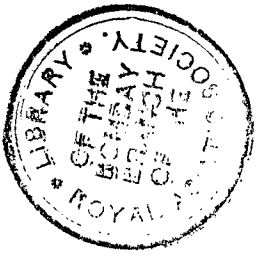

ANNUAL REPORT

OF THE

DIRECTOR

TECHNOLOGICAL LABORATORY

FOR THE

YEAR ENDING 31st MAY 1941

Annual Report of the Director, Technological Laboratory, for the Year Ending 31st May 1941.

THE present report contains an account of the work done in the Technological Laboratory in the period, 1st June 1940 to 31st May 1941. This period is noteworthy for three important events. The first is the arrangement entered into between the Indian Stores Department of the Government of India and the Indian Central Cotton Committee whereby the Technological Laboratory has been recognised as the official Testing House for the mills in Bombay Province, and the principle has been accepted that the reports issued from the Laboratory would be regarded as authoritative. The Technological Laboratory has already been recognised by the Millowners' Associations of Bombay and Ahmedabad as their official Testing House and the recognition by the Government of India Stores Department marks a new direction in which the Laboratory has been able to render useful service to the Textile Industry. The second noteworthy event is the exceptionally large increase in the number of samples tested at the Laboratory during the year under review. Last year the total number of samples tested at the Laboratory was 768, which itself constituted a record figure for all the previous years, but during the year under review the total number of samples tested rose to 1,800, which is nearly 2½ times the previous figure. Many of these samples were received either from the Indian Stores Department or from the cotton mills in accordance with the arrangement referred to above, and work on these samples may be regarded as a contribution to war effort by the Committee. But, as will be seen from a perusal of the report a steady progress was maintained in the other activities of the Laboratory which were not directly affected by this arrangement. The third noteworthy event in this period is the opening of the new Ginning Section at the Laboratory. The scheme for starting a Ginning Section had been sanctioned by the Committee sometime ago, and during the period under review the necessary extensions to the Laboratory building were completed and the machines received for this Section were installed in the new building. It was also possible to carry out ginning tests with various speeds, settings, etc., on six different varieties of Indian kapas, details of which will be given in this report. The work done at the Laboratory for the year ending 31st May 1941 will now be described under the following heads :—

I. Spinning Laboratory.
II. Testing House.
III. Fibre Testing Section.
IV. Technological Research.
V. Ginning Section.
VI. Moisture Testing Section.
VII. Publications.
VIII. General.

I. SPINNING LABORATORY.

As usual, two statements A and B have been prepared. Statement A gives details of the samples of lint which were either received for spinning tests or tested at the Laboratory during the period under review, while statement B gives details of the small size samples which were either received for fibre tests or tested during this period. In the case of both statements, details are given of the description of cotton, name of supplier and numbers of the test reports in such cases where the tests were completed.

The samples received for tests during the period under review have been classified in Table I which also shows against each the corresponding figures for last year.

TABLE I.

No. of Samples received for Tests.

Description.	1-6-39 to 31-5-40	1-6-40 to 31-5-41
Agricultural Departments	342	446
Standard Cottons	14	23
Trade Tests	51	74
Fibre ,, ...	140	180
Yarn ,, ...	80	327
Cloth ,, ...	119	697
Special ,, ...	22	48
Miscellaneous	..	5
Grand Total ..	768	1,800

It will be noticed that each class of sample shows an increase as compared with last year, the increase being most pronounced in the case of the yarn and cloth samples. In the case of the former more than four times and in the case of the latter nearly five times as many samples were received as in the last year. These samples were received either from the Indian Stores Department or from the cotton mills and firms in connection with the enquiries made from them by the Government Departments. But, apart from these samples, an increase of nearly 30 per cent. would be seen in the case of samples received for spinning tests from the Agricultural Departments, while the number of samples received for fibre tests also showed an increase of nearly 30 per cent. as compared with last year. The total number of samples received for tests, as mentioned in the opening paragraph, is 1,800 which is nearly $2\frac{1}{2}$ times that received in the last year.

The following statement C gives the number of agricultural samples spun during the year under review together with the names or official designations of the suppliers of these samples. This statement refers only to the agricultural samples which were subjected to the spinning tests at the Laboratory, while similar details for the standard cottons and the cottons belonging to the trade varieties will be found on pages 9-12.

STATEMENT C.

BOMBAY.

(1) *The Cotton Breeder, Jalgaon.*—22 samples of Verum, Jarilla and other strains.

(2) *The Cotton Breeder, Broach.*—3 samples of crosses.

(3) *The Superintendent, Cotton Farm, Vesma.*—5 samples of 1027 A.L.F., and other strains.

(4) *The Cotton Breeder, Viramgam.*—13 samples of strains.

(5) *The Cotton Breeder, Surat.*—7 samples of strains.

(6) *The Rural Development Officer, Bardoli.*—2 samples of Agmark cottons.

(7) *The Cotton Breeder, Dharwar.*—7 samples of Jayawant and other strains.

(8) *The Cotton Assistant, Bardoli.*—2 samples of Agmark cottons.

(9) *The Chief Marketing Officer, Bombay.*—6 samples of Agmark Bardoli cottons.

(10) *The Agricultural Overseer, Hansot, District Broach.*—2 samples of cotton.

SIND.

(1) *The Agricultural Engineer in Sind, Mirpurkhas.*—5 samples of cottons.

(2) *The Botanist, Agricultural Research Station, Sakrand.*—5 samples of strains.

PUNJAB.

(1) *The Cotton Research Botanist, Lyallpur.*—50 samples of different strains.

UNITED PROVINCES.

(1) *The Economic Botanist, U.P., Cawnpore.*—14 samples of cottons.

MADRAS.

(1) *The Farm Manager, Agricultural Res. Station, Koilpatti.*—8 samples of strains.

(2) *The Superintendent, Dry Farming Station, Bellary.*—7 samples of A265, H.1., and other strains.

(3) *The Cotton Assistant, Mungari Scheme, Adoni.*—7 samples of Local and other strains.

(4) *The Farm Manager, Nandyal.*—1 sample of selection.

(5) *The Cotton Specialist, Coimbatore.*—10 samples of cottons.

CENTRAL PROVINCES.

(1) *The Research Officer, Berar Cotton Breeding Scheme, Akola.*—4 samples of strains.

(2) *The Superintendent, Government Experimental Farm, Akola.*—1 sample of Buri cotton.

(3) *The Marketing Officer for Verum, Nagpur.*—2 samples of Verum.

INDORE.

(1) *The Director, Institute of Plant Industry, Indore.*—51 samples of Dhar Malvi, Verum and other strains.

HYDERABAD.

(1) *The Cotton Research Botanist, Parbhani.*—33 samples of strains.

(2) *The Inspector, Cottonseed Distribution, Kopbal.*—5 samples of Local, Raichur Kumpta and Jayawant.

(3) *The Superintendent, Government Main Farm, Raichur.*—5 samples of R. K. and Hagari cottons.

BARODA.

(1) *The Cotton Officer, Navsari.*—1 sample of selection.

(2) *The Assistant Cotton Breeder, Amreli.*—16 samples of selections.

(3) *The Superintendent, Government Farm, Dabhoi.*—3 samples of selections.

(4) *The Assistant Cotton Breeder, Jagudan.*—5 samples of selections.

(5) *The Officer in charge, C. R. R. Scheme, Baroda.*—6 samples of Broach and Karakhadi cottons.

BIKANER.

(1) *The Agricultural Officer, Ganganagar, Bikaner State.*—2 samples of selections.

BENGAL.

(1) *The 2nd Economic Botanist, Dacca.*—7 samples of 289F cotton.

FOREIGN.

(1) *The Deputy Director of Agriculture, Meiktilla, Burma.*—8 samples of selections.

(2) *The Senior Botanist, A.R.S., Kawanda, Uganda.*—8 samples of strains.

The following Tables II and III give the distribution of samples and yarns spun at the Laboratory during the period under review together with the corresponding figures for each of the years since 1924-25.

TABLE II.—*Distribution of Samples spun*, 1924-41.

Province	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.	1939-40.	1940-41.
Bombay	18	26	22	22	28	66	89	69	143	111	97	59	67	44	78	42	69
Sind	..	..	..	..	..	..	..	..	..	..	..	28	47	..	21	8	10
Punjab	14	1	..	..	42	30	10	44	55	42	23	71	9	45	57	61	50
U. P.	7	..	6	11	9	7	16	7	12	6	7	11	..	2	36	66	14
Madras	2	19	50	23	30	51	66	15	28	101	30	51	31	31	42	30	33
C. P.	2	..	3	2	2	5	3	3	5	9	9	10	15	9	9	5	7
Miscellaneous	3	11	..	6	6	27	28	33	75	97	85	100	85	97	104	97	150
Total	46	57	81	64	117	186	212	171	318	366	251	330	254	228	347	309	333
Standard Cotton Tests ..	8	54	49	64	33	34	27	18	18	16	18	23	15	21	21	19	21
Trade Tests and Special Tests	..	..	..	..	..	37	89	134	125	166	131	143	162	185	172	122	169
Grand Total ..	54	111	130	128	150	257	328	323	461	548	400	496	431	434	540	450	523

TABLE III.—*Distribution of Yarns spun*, 1924-41.

Province	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.	1939-40.	1940-41.
Bombay	103	152	132	132	159	322	253	203	430	332	292	190	217	134	249	127	195
Sind	..	..	..	..	..	..	..	..	..	..	..	84	143	..	68	26	32
Punjab	106	14	..	..	254	113	31	136	165	127	72	220	28	144	168	195	149
U. P.	27	..	36	66	54	42	40	22	32	18	21	35	..	6	94	197	43
Madras	12	108	278	138	180	255	199	53	85	303	90	151	89	91	123	92	93
C. P.	8	..	18	12	12	30	12	9	15	27	29	30	45	28	26	15	21
Miscellaneous	3	58	..	36	27	99	100	93	227	293	250	295	261	292	299	281	433
Total	259	332	464	384	686	861	635	516	954	1,100	754	1,005	783	695	1,027	933	966
Standard Cotton Tests ..	95	514	423	447	290	223	309	136	200	180	204	162	115	156	152	144	152
Trade Tests and Special Tests	..	..	..	..	..	80	343	502	256	499	810	609	649	665	498	423	410
Grand Total ..	354	846	887	831	976	1,164	1,287	1,154	1,410	1,779	1,768	1,776	1,547	1,516	1,677	1,500	1,528

It will be noticed that the total number of samples spun during this period was 523 as against 450 in the last year. After the installation last year of the cooling plant in the Spinning Room, the work in this Section was maintained at a high speed except for a few weeks when it had to be stopped owing to the relevelling of the floor, which had sunk in several places. It is, therefore, gratifying to note that despite this temporary stoppage of work, the total number spun in the year was practically equal to that spun in 1938-39, and shows an increase of 16 per cent. over the figure for last year.

The following table IV gives a summary of the reports of different types issued from the Laboratory during the period under review together with the corresponding figures for the previous years.

TABLE IV.—*Test Reports Issued*, 1924-41.

Reports	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.	1939-40.	1940-41.
Spinning Test	7	19	19	22	21	63	92	60	87	121	112	135	129	109	127	114	135
Fibre Test	1	1	5	1	7	4	7	19	30	18	19	44	52	32	35	42	52
Yarn Test	..	..	..	1	4	4	2	3	5	3	7	13	10	14	20	36	234
Cloth Test	..	..	..	..	..	..	..	..	..	..	..	..	..	..	25	69	624
Statistical Analysis ..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	3	..	..
Miscellaneous	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1
Total Reports ..	8	20	24	24	32	71	101	82	122	142	138	192	191	158	211	261	1,046

It will be noticed that a larger number of reports of each type were issued as compared with last year, the increase being very pronounced indeed in the case of the yarn test and cloth test reports, which related mostly to the samples received from the Indian Stores Department or the cotton mills and firms in connection with the Government's requirements. This new activity of the Laboratory, however, was not allowed to affect the older activities as will be seen that the number of spinning test reports issued during the year also shows an increase of more than 18 per cent. while the fibre test reports show an increase of 24 per cent. over the last year's figures. The total number of reports issued during the year amounted to 1,046 which is four times the total number issued in the course of last year.

The following Table V gives the strength of the permanent staff employed at the Laboratory during the year together with the corresponding figures for the previous years :—

TABLE V.—*Permanent Staff*, 1924-41.

	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941
Technical and Office staff ..	8	11	20	24	27	27	32	32	32	33	34	34	35	36	36	36	38	39
Research Students ..	1	3	6	4	3	2	1	1	..	..	..	..	2	2	2	1	..	..
Fumigation Chemists.	..	..	2	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total ..	9	14	28	32	32	31	35	35	34	35	36	36	39	40	40	39	40	41

It will be seen that the strength of the permanent staff remained practically the same as before. However, in order to cope with the large number of yarn and cloth samples received from the Government Departments and the mills a number of temporary appointments were made of which the details will be found on page 37.

Most of the samples tested at the Laboratory during the period under review were of a routine nature, but some of them possessed special features which are worthy of mention. These are as follows :—

A. AGRICULTURAL SAMPLES.

(1) *Surat cottons.*—By crossing 1027 A.L.F. with 1A Long Boll, the Department of Agriculture, Bombay, has obtained a new strain called Segregate 8-1, which has proved a better resistant to wilt than either of its parents. Spinning tests carried out in the past on this Segregate at the Technological Laboratory have given encouraging results, and during the period under review arrangements were made for carrying out mill tests on large size samples of the segregate and its parents. Comparative tests were carried out at the Laboratory as well, and it was found that while in the Laboratory Segregate 8-1 did not give as good performance as either of its parents, the mill tests were not quite conclusive. Arrangements have been made for carrying out mill tests on samples of these cottons belonging to the 1940-41 season.

(2) *United Provinces cottons.*—Samples of four varieties of cotton, namely, C.402, C.520, Perso-American and Local grown in seven different centres in the U.P. were tested in order to study the effect of locality on lint quality. It was found that Perso-American gave the best results among these cottons, being significantly longer than the others, while both C.402 and C.520 were also significantly longer and gave stronger yarns than the local cotton. As regards the effect of locality, it was interesting to note that C.402 gave the best results when grown at Cawnpore, C.520 gave the poorest results when grown at Raya, while the sample of Perso-American grown at Cawnpore gave the weakest yarns.

(3) *Cottons grown in Sangli State.*—Two cottons, Gujerat 1027 A.L.F., and Avinashi Cambodia, grown in Kesabe Digraj, a village in Sangli State were supplied for tests. The seeds of the former cotton were imported from the Model Farm, Baroda, while those of the latter cotton were obtained from Sundarapuram in Madras Presidency. According to the tests carried out at the Laboratory both cottons gave better performance than the commercial samples of Hubli Kumpta and Hubli Jayawant, but neither of them came to the level of the standard Kumpta cotton grown at Bailhongal. The Avinashi Cambodia was found to be nearly 5% more wasty than the Standard Cambodia grown at Coimbatore and yielded somewhat-neppier and weaker yarns as compared with the latter cotton.

(4) *Jarilla cotton.*—This cotton has now spread over a considerable area in Khandesh and during the period under review samples grown at four localities in East Khandesh and two localities in West Khandesh were subjected to fibre and spinning tests at the Laboratory. These samples were raised on cultivators' fields from seed obtained from Government Farm, and in three cases their performance was even better than that of the farm cotton, inspite of the fact that the other conditions such as roguing, weeding, picking, etc., could not be so good in the cultivators' lands as on the farm. These results bring out, in a forceful manner, the good results of growing an improved variety of cotton from pure seed and the desirability of supplying such seed in sufficiently large quantities to the cultivators.

(5) *Uganda cottons.*—As in the past, fibre and spinning tests were made during the year under review on eight samples of Uganda cottons supplied by the Senior Botanist, Agricultural Research Station, Kawanda. Of these, four samples were grown on the eastern side of the river Nile, while the remaining four were grown on the western side. The average performance of the samples grown on the eastern side was practically the same as that of the samples raised on western side of the river Nile. Among the former, a variety called ' M.2 ' gave the best results, while among the latter a variety known as X.3 gave the strongest yarns. With the exception of the sample of Buganda Local, however, the differences in the performance of these varieties were not large. [In view of the special importance of these cottons, a copy of the Spinning Test Report issued on them is attached as Appendix I.]

(6) *Bikaner State cottons.*—The two improved varieties C.520 and 119 Sanguineum are being tried in Bikaner State and during the period under review their samples were received for tests from the Agricultural Officer of the State. The tests carried out at the Laboratory showed that C.520 was very nearly equal in spinning performance to its sample grown at Cawnpore, but that 119 Sanguineum was inferior to its sample grown at Lyallpur.

(7) *Tests on Agmark samples of* 1027 *A.L.F.*—The Agmark is now being applied to cottons grown in certain areas. During the period under review the question arose as to whether 1027 A.L.F. grown in British India territory adjoining the Baroda State was of the same quality as that grown within the State, the Agmark being applied to both cottons. In order to settle this point ten samples of 1027 A.L.F. cotton, of which six were grown in the British India territory and four in the Baroda State, were supplied for tests by the Senior Marketing Officer, Imperial Council of Agricultural Research, Delhi. The tests carried out at the Laboratory showed that there was very little difference in respect of their fibre properties and waste losses between these samples, but that the samples grown in British India territory gave, on the whole, slightly stronger but somewhat neppier yarns than those grown in the adjoining districts of Baroda State.

(8) *Growing of long staple cottons in Bengal.*—It has been mentioned in the previous reports that strenuous efforts are being made to grow medium and long staple cottons in Bengal. During the period under review, samples

of 289F grown in seven different localities possessing very different types of soil were tested at the Laboratory. These samples generally maintained their good performance of last year, and it was found that the Murshidabad sample gave better performance than the Standard P.A. 289F grown at Lyallpur, while the samples from Comilla, Naogaon, Mymensingh and Dacca gave practically the same test as the Standard cotton.

(9) *Variety trials at Indore and Dhar.*—Samples of seven cottons grown at Indore and Dhar were received for tests from the Institute of Plant Industry, Indore. A noteworthy climatic difference between the two places was that while no rains fell at Indore after the first week of September, heavy rains fell at Dhar in the first week of October. It was reported that the samples grown at Dhar gave, on the whole, 8 per cent. higher ginning percentage each as compared with those grown at Indore. The tests carried out at the Laboratory showed that the Dhar samples possessed longer, coarser and more mature hairs than the Indore samples, and that these differences in the fibre properties were sufficient to explain the observed differences in the ginning percentages of five cottons, but that they could not account for the differences in the ginning percentages of the remaining two cottons.

(10) *Co. 2 grown at Parbhani.*—In the course of a discussion in one of the Conferences between the Technological Assistants and the Research Staff of the Laboratory, it was suggested that some standard cottons may be grown at places other than their homes in order to study the effect of different climatic and soil conditions upon these cottons. Accordingly, a sample of Co. 2 grown at the Government Main Farm, Parbhani, from the seed obtained from Coimbatore was supplied to the Laboratory for tests. It was interesting to observe that this sample was 11 per cent. longer and 9 per cent. finer than the Coimbatore cotton, it possessed a significantly higher percentage of mature fibres and gave better spinning performance as compared with the latter.

(11) *Gaorani 6 cotton grown in Hyderabad State.*—In the last few years the cultivation of Gaorani 6 has spread over a fairly large area in Hyderabad State. During the period under review two samples of this cotton were received for tests, one of which was grown at the Government Main Farm, Parbhani, while the other was grown in the cultivators' lands. It was found that the latter sample possessed shorter, more irregular and coarser staple, gave more waste in the blow-room and produced definitely weaker yarns in the ring frame as compared with the farm cotton. It would thus appear that unless adequate measures are taken to maintain the purity of the seed, the grade and performance of this cotton when grown on the cultivators' lands it is likely to go down as compared with the farm cotton.

B. Standard Cottons.

As usual, detailed tests were carried out on samples of standard Indian cottons, and a Technological Bulletin containing the results for the 1939-40 cottons was published during the period under review. Prior to the

publication of this bulletin technological circulars had been issued on those cottons which were received fairly early in the season. It should be mentioned in this connection that results relating to L.S.S. cotton grown in the Punjab were included for the first time in the bulletin referred to above.

The following statement gives the names of the standard Indian cottons of the 1940-41 season which were received in the Laboratory during the period under review. Of these, tests have been already completed on Umri Bani, Jarilla, Verum 262 (Akola), and V. 434 (Akola) and 4-page Technological Circulars have been issued on these cottons, while tests on the remaining cottons are in progress.

BOMBAY :

1. Jayawant.
2. Gadag 1 (Dharwar-American).
3. Surat 1027 A.L.F.
4. Wagad 8.
5. Jarilla.

SIND :

6. Sind Sudhar (289F-1).
7. Sind N. R. (W. N. 27).

PUNJAB :

8. Punjab-American 289F/K. 25.

CENTRAL PROVINCES.

9. Verum 262 (Nagpur).
10. Verum 262 (Akola).
11. V. 434 (Akola).
12. Late Verum (Nagpur).

HYDERABAD :

13. Umri Bani.
14. Gaorani 6.

MADRAS :

15. Cambodia Co. 2 (Cambodia 440).
16. Nandyal 14 (Northerns).
17. Hagari 1 (Westerns).

It may be mentioned in this connection that from the old list two cottons, namely, A. 19 and C. 402, both from the United Provinces, were deleted by the Committee as these cottons are no longer grown on a large scale. Furthermore, three new cottons, namely, Jarilla, 289F/K. 25 and Gaorani

6, which are now being grown on fairly large areas have been added to the list. Samples of these cottons have been received and their results will be included in the next issue of the Bulletin. It should also be stated here that the Indian Central Cotton Committee has decided that tests should be carried out on roller-ginned as well as saw-ginned samples of Sind Sudhar cotton.

C. Trade Varieties.

In accordance with the arrangement entered into between the Indian Central Cotton Committee on the one hand and the East India Cotton Association Ltd., Bombay, and the Millowners' Associations of Bombay and Ahmedabad on the other hand, samples of fair average quality of the chief trade varieties and their early arrivals in the market were received and tested at the Laboratory. The results of these tests were first published in the form of 2-3 page Technological Circulars as soon as tests on each sample were completed, and later on, these circulars were compiled in the form of a Technological Bulletin on Trade Varieties of Indian Cottons, 1940, which was issued during the period under review. It should be mentioned here that from the current list samples of 8 cottons, namely, Kadi-Viramgam, Farm Westerns, Upland, Bijapur, Tinnevelly, Cambodia, Karunganni and A. R. Busoga were not received from the East India Cotton Association. It was stated that these cottons did not come into the Bombay market in sufficiently large quantities as they were mostly sold or consumed in or near the centres where they are produced, and therefore the Association was not in a position to supply samples of fair average qualities of these cottons. It should further be stated that three new cottons, namely, Verum, Gaorani 6 and 289F/43 were added to the list, but samples of these cottons were also not received in 1939-40 on the ground that these cottons were not known to the trade in Bombay. Acting on this information arrangements were made to obtain samples of these cottons of the 1940-41 season from the Agricultural Departments, but after these samples had been received from these Departments, the East India Cotton Association was in a position to supply samples of two cottons, namely, Verum and 289F/43, on which tests have been made.

The following samples of trade varieties of the 1940-41 season have been received in the Laboratory during the period under review. A list of the Technological Circulars issued on these samples on which the tests were completed will be found under the head " Publications."

1. *Samples supplied by the East India Cotton Association.*

1. C. P. No. 1
2. Berar.
3. Khandesh.
4. Latur.
5. Punjab-American 4F.
6. Punjab-American L.S.S.
7. Punjab-American 289F.
8. Sind Sudhar (289F-1).
9. P. A. 289F/43.
10. Verum.

2. *Sample supplied by the Agricultural Department, H. E. H. the Nizam's Dominions.*

1. Gaorani 6.

3. *Samples supplied through the Millowners' Association, Bombay.*

1. Farm Westerns.
2. Bailhongal.
3. Broach.
4. Westerns.
5. Miraj.
6. Hubli Kumpta.
7. Hubli Upland.

4. *Samples supplied through the Southern India Millowners' Association, Coimbatore.*

1. Cambodia.
2. Karunganni.
3. Tinnevelly.

At its last meeting the Indian Central Cotton Committee decided that more samples of the trade varieties should be obtained through the Millowners' Association, Ahmedabad, and also that the Southern India Millowners' Association may be asked to supply samples of Cambodia, Karunganni and Tinnevelly, which had so far been received through the Millowners' Association, Bombay. The Southern India Millowners' Association have kindly supplied samples of Cambodia, Karunganni and Tinnevelly and these are at present under tests.

II. TESTING HOUSE.

This Section was started in 1937 and since then the number of tests carried out in this Section has shown a steady increase as will be seen from the following table which also gives a classification of these tests.

TABLE VI.

Tests.	1936–37	1937–38	1938–39	1939–40	1940–41
Spinning Tests	6	12	11	20	45
Fibre Tests	24	26	36	67	51
Yarn Tests	23	37	49	80	323
Cloth Tests	..	23	39	117	696
Moisture Tests	41	20	8	19	4
Shirley Analyser Tests ..	1	..	..	1	..
Blow Room Tests	1	..	..	..	..
Dye Absorption Tests ..	..	..	2	..	..
Miscellaneous Tests	..	..	..	..	1
Total ..	96	118	145	304	1,120

It will be seen that the total number of samples, which in 1938-39 stood at 145, rose to 304 in 1939-40, and to 1,120 in the year under review. The steady increase in the past years is a proof of the growing confidence in the work of the Laboratory and of the useful service which it has been able to render to trade and industry. The large increase in the year under review is due mostly to the samples received in connection with the Government supply orders, and this increase is most pronounced in the case of yarn and cloth samples, though the samples received for spinning tests also show a good increase. The volume of work now being done in this Section may be judged from the fact that during the last six months 618 samples were received and tested in this Section.

The samples received in the Testing House cover a very wide range including fabrics of all kinds, single and ply yarns, sewing thread, parachute cloth, airman's webbing, service dressings, absorbent cotton, etc. The tests carried out on these samples also cover a very wide range, and during the year under review in addition to the ordinary physical tests such as tensile strength, actual counts, turns per inch, dye fastness, scouring loss, shrinkage, etc., 174 samples were subjected to chemical and physico-chemical tests such as ash content, wax content, wettability, hydrogen-ion concentration, water-proofing, nature of sizing and finishing material, etc.

Most of the tests carried out in the Testing House were of a routine character, but some of the samples deserve special mention. They are as follows :—

(1) A local mill had encountered a fair amount of trouble with its cloth which was found to be fluffy to an unusual degree. Samples of mill yarn, roving bobbins, drawing sliver, scutcher lap and cotton mixture from which this cloth was manufactured were sent to the Laboratory for detailed tests, and after due examination and necessary tests a report was issued to the mill drawing their attention to the most probable causes which might have contributed to the observed defect in the cloth.

(2) Five samples of coloured cloth were received from the Marwari Chamber of Commerce, Calcutta, for measurement of colour and shade against the basic standard samples which were also supplied by the Chamber and for measurement of reeds and picks and counts of warp and weft yarns. The measurements of colour and shade were made with the help of a tintometer and a detailed report was issued on these samples.

(3) A firm submitted a sample of cloth punctured with a number of holes while the selvedges of the cloth were torn or damaged at several places. Some of the holes showed brown discolouration around their edges. The firm was anxious to know the causes responsible for this damage. The necessary tests were made, and it was found that the damage was due to the contamination of the cloth with dirty lubricating oil which contained iron particles suspended in it. A report was issued to the firm giving the detailed results of these tests and drawing their attention to the causes responsible for the damage.

(4) A mill sent two samples of cloth one of which was marked ' bleached ' and the other marked ' bleached-tendered.' The mill was anxious to find out the causes of tendering in the latter sample and also requested that suitable remedies for avoiding this defect in the future may be suggested in the report. The tests carried out on these two samples showed that the tendering was caused by the oxidation of cellulose in the bleaching process which was most probably due to the use of old bleaching liquor having a pH value on the acid side. The mill was supplied with a detailed report in which suitable remedies for avoiding similar trouble in the future were suggested.

(5) A highly tendered dhoti cloth was received from a firm for examination with a view to finding out the causes responsible for tendering in this particular case. The necessary tests were made, and it was found that the tendering was due to the oxidation of the cellulose in the peroxide and chlorine bleaching processes. It was found that the strength of the peroxide used in the bleaching process was rather high, while the duration of the bleaching treatment was also fairly long, and that these two factors may have been responsible for the observed tendering of the cloth. A report was issued in which suitable modifications in the bleaching treatment were suggested for avoiding this trouble in future.

(6) *Ceylon cottons.*—Four samples of cotton grown in Ceylon were received for tests through the Ceylon Trade Commissioner for India, Bombay. It was stated that two of these samples belonged to the Uganda type, while the other two samples were Cambodia Co. 2 and Cambodia Local. The tests carried out at the Laboratory showed that the Co. 2 samples grown in Ceylon were somewhat longer than the Standard cotton raised at Coimbatore, while the Local Cambodia grown in Ceylon had practically the same staple length as good quality commercial Cambodia cottons.

It will be seen from the above-mentioned cases that in addition to a large number of routine tests, the Testing House of the Laboratory carried out a number of small *ad hoc* investigations for the benefit of the textile industry. The Laboratory is now fully equipped for all types of tests and analytical work on cotton, yarns and cloth, and such *ad hoc* investigations not only serve to establish a close liason between the Laboratory and the mills, but enable the latter, it is hoped, to solve their difficulties and improve the quality of their finished products.

(7) *Analysis of coir yarns.*—During the period under review a proposal was received from the Agricultural Marketing Adviser to the Government of India that the resources of the Laboratory might be utilised for the purpose of analysing samples of coir yarns which were to be collected by a member of his staff in Southern India. The Committee sanctioned this proposal and two Junior Testers were appointed for this work. In all 171 samples of coir yarns were received from the Agricultural Marketing Officer and they were tested for each of the following characteristics.

(1) *Colour.*—A shade card of ten different shades was prepared and the coir samples were matched against one or other of the shades on this card. The standard shades were analysed with the help of a tintometer.

(2) *Turns per inch.*—The number of turns per inch in one foot length of the yarn were noted at intervals of 2 feet.

(3) *Diameter.*—The diameter of the yarns was measured at frequent intervals with a vernier slide callipers.

(4) *Scorage.*—The yarn was closely wound on a wooden cylinder mounted on two iron brackets and the number of coils occurring in a given length was noted. From this the ' scorage ' which is the number in 3 feet length divided by 20 was calculated.

(5) *Weight.*—A measured length of the yarn was weighed and from this the number of yards per lb. was calculated.

(6) *Strength.*—Tests were made on 22″ length of yarn on a lea tester fitted with a special attachment for testing these yarns.

(7) *Moisture.*—Moisture tests were carried out in a conditioning oven and the percentages of moisture content and moisture regain were calculated.

(8) *Pith.*—A known length of the yarn was first weighed. It was then untwisted and the components were rubbed against each other. The small bits of pith were collected and weighed after removal of the broken fibres.

The experimental part of this work has been completed and a report is under preparation.

III. FIBRE TESTING SECTION.

This Section was kept fully occupied in carrying out fibre tests on large size samples of cotton which had been received for spinning and fibre tests and small size samples received for fibre tests only. Details of the large size samples have already been given on page 3. The number of small size samples on which fibre tests were made during the period under review was 186 and the following statement gives details of these samples :—

STATEMENT D.

1. *The Officer in Charge, C.R.R. Scheme, Baroda.*—8 samples of 1027 A.L.F. Selections.

2. *The Cotton Breeder, S.M.C., Dharwar.*—4 samples of crosses.

3. *The Assistant Cotton Breeder, Amreli, Kathiawar.*—26 samples of Mathio progenies.

4. *The Assistant Cotton Breeder, Jagudan.*—3 samples of cotton.

5. *The Cotton Breeder, Jalgaon.*—14 samples of crosses.

6. *A mill in Bombay.*—12 samples of Egyptian cottons, mixings, etc.

7. *The Farm Manager, A.R.S., Koilpatti.*—10 samples of strains.

8. *The Controller of Inspection, I.S.D., Bombay.*—6 samples of Kapok and other cottons.

9. *The Director of Agriculture, Shillong, Assam.*—2 samples of Upland American cotton.

10. *A mill in Bombay.*—1 sample of card strips.

11. *The Controller General of Purchase, New Delhi.*—3 samples of cotton.

12. *The Director, Institute of Plant Industry, Indore.*—35 samples of Dhar and other cottons.

13. *The Director of Agriculture, Bihar, Patna.*—5 samples of cotton.

14. *The Ceylon Trade Commissioner, Bombay.*—4 samples of cotton.

15. *A firm in Bombay.*—16 samples of foreign cotton.

16. *The Agricultural Overseer, Hansot, Dist. Broach.*—9 samples of varieties.

17. *A mill in Jagunathpur (Bengal).*—1 sample of cotton.

18. *The Agricultural Commissioner with the Government of India, Delhi.* —2 samples of cotton.

19. *The Agricultural Officer, Sri Ganganagar, Bikaner State.*—3 samples of cotton.

20. *A mill in Bombay.*—3 samples of sliver.

21. *The Export Trade Controller, Bombay.*—2 samples of foreign cotton.

22. *A firm in Bombay.*—14 samples of Navsari and other cottons.

23. *A firm in Midnapore.*—1 sample of long staple cotton.

24. *The Cotton Breeder, Surat.*—1 sample of Segregate.

25. *The Cotton Research Officer, Rangamati.*—1 sample of strain.

The total number of samples tested in this Section during the period under review is 639. Most of these tests were of a routine character, but some among them deserve mention. These are as follows :—

(1) *Mathio cottons.*—In the selection of suitable strains of Mathio cotton, attention has to be paid not only to their fibre properties but also to the amount of leaf associated with them. Last year 15 samples belonging to promising strains of Mathio cotton were received for tests at the Laboratory, but as the season was extremely unfavourable, these samples were much too small for the determination of trash. Therefore, only fibre tests were performed on these samples. During the year under review, no less than 49 samples were received, but of these only 15 samples were sufficient in size for the determination of trash associated with them. These tests were carried out and a report was issued.

(2) *Upland American cotton grown in Assam.*—This cotton is grown in hilly tracts in Assam at a height of about 2,000 ft. from seed which is said to have been imported originally from America. It is presumed to be an Upland cotton grown in the U.S.A. both in the plains and at higher altitudes. The fibre tests carried out on the sample grown in Assam gave very promising results, the mean fibre-length of the sample being nearly 1.3 inches which surpasses the values obtained for most of the Indian cottons tested at the Laboratory. Furthermore, a fairly low fibre-weight per inch and a fibre-length irregularity percentage of only 9 per cent. were additional points in favour of this cotton. If it continues to maintain these fibre properties in the following seasons, it should constitute a noteworthy advance on the usual run of cottons grown in India.

(3) *Wilt-resistant strains for Surat area.*—Certain parts of the Surat tract are becoming infected with wilt, and attempts are, therefore, being made to develop a wilt-resistant strain for this area. During the period under review samples of 9 strains including 3 selections from 1027 A.L.F., 3 crosses between Seg. 8-1 and 1027 A.L.F. and 3 back-crosses were received in connection with the scheme to evolve a wilt-resistant strain for this area. These samples were raised in the wilt-affected plots in Shera near Ankleshwar and were analysed for fibre properties and a detailed report was issued.

(4) *Bihar cottons.*—Two samples grown in Devghar and 3 samples grown in Hansdiha were received for tests. These cottons, locally known as Kocha Cascum (red and white varieties in Devghar) and Kokti red, Kocha white and Tandi (Hansdiha) are not pure lines, and, therefore, offer scope for further selection. Devghar cottons were grown in red sandy loam, while at Hansdiha the samples were grown on red soil. Their ginning percentages showed very considerable variation, being 24 per cent. for Tandi and 37 per cent. for Cocha white. The mean fibre-length was 0.62″ for Tandi and 0.73″ for Kocha white cotton. It may be mentioned here that Kocha Cascum red and Kokti red have a distinctly reddish brown colour like the Cocanada cotton.

(5) *Cottons grown from vernalised seed.*—Two samples of cotton, one of L.S.S. (Punjab) and the other of Sea Island, were supplied by the Agricultural Commissioner with the Government of India. These samples were grown from vernalised seed at Almora and the object of the test was to compare their fibre properties with those raised from ordinary seed. The comparison of the Sea Island cotton could not be made as the particular seed from which it was grown was not known, but the L.S.S. grown from the vernalised seed was found to be 13 per cent. longer but 14 per cent. coarser than that grown from ordinary seed at Lyallpur. These are the first experiments in India on cotton grown from vernalised seed, and further experiments on a larger number of cottons should give interesting results.

(6) *Rangamati cotton.*—This cotton possesses some peculiar features. It is grown on hilly slopes of hills in the Chittagong Hill Tract in Bengal, its seed is sown in May and harvested in December and it receives about 90 to 120 inches of rainfall. It has a ginning percentage of 44. The Laboratory tests showed that this year's sample was slightly shorter and coarser in staple than last year's sample, but that the wax content remained unchanged.

IV. TECHNOLOGICAL RESEARCH.

A number of technological investigations are in progress at the Laboratory and a brief account of the progress made with each investigation will now be given.

(1) *Pre-cleaning and ginning of Indian cottons.*—The work on these problems started in March 1941 after the erection of the machinery in the gin room. From the approved programme, the comparison of the efficiency of the three different types of pre-cleaning machines, the comparison of single-roller, double-roller and saw gins, the effect of saw speed in the saw gin and the effect of overlap setting in the roller gin were selected and investigated during the period under review. As these experiments are being made on 8 different varieties of seed-cotton, the differential response of the cottons to the treatments in the opening machines and the gins and the relative efficiency of each machine are also included within the purview of this investigation. Of the cottons selected, experiments on pre-cleaning and ginning have been completed on six cottons, while experiments have yet to be performed on two cottons, namely, Sind Sudhar and Verum. In each case a record was maintained of the production per hour, consumption of power, visible and invisible waste, ginning percentage, nature of trash, etc. and these factors will be given due consideration. The examination of the fibre properties and the spinning performance of the large number of samples obtained by different speeds and settings and different types of pre-cleaning machines and gins is now in progress. As the experiments have only just begun it is not possible to give even a brief summary of the tentative results so far obtained, but this will be done as soon as the analysis of the data has been completed.

(2) *The effect of different speeds of beater and fan in the Crighton opener on the fibre-properties and yarn characteristics of Indian cottons.*—This investigation has been undertaken by Mr. R. S. Koshal in collaboration with the Spinning Master. During the period under review the tests were completed on P.A. 289F. A complete analysis of the experimental data relating to this cotton is not yet available, but the following tentative conclusions may be drawn from the analysis which has so far been applied to the results :—

(*i*) For the 7 treatments comprising 3 beater speeds and 3 fan speeds as studied in this investigation, passage of cotton twice through Crighton gave the lowest waste percentage.

(*ii*) Passing the cotton twice through the Crighton opener reduces the waste in the scutcher lap, but this advantage is found to be greater with the higher than with the lower fan speed. This conclusion is supported by the results of card loss which are in general agreement with those of the Shirley Analyser tests.

The complete analysis of the results, including the fibre and the yarn test results, is now being made.

After completing the experimental work on P.A. 289F, blow-room tests with a view to studying the effect of different beater and fan speeds in the Crighton opener were undertaken on good quality Hubli Kumpta cotton. The samples obtained with the different treatments in the blow-room have been spun, but the fibre tests and yarn tests including tests for estimating the mechanical damage to the fibres, which take a great deal of time, have not yet been completed. So far fibre length tests have been made on 15 samples, tests for estimating mechanical damage on 14 samples and yarn tests on 11 samples. This work is in progress, and the analysis of the results will be undertaken immediately after the analysis of results of 289F has been completed.

(3) *Comparative spinning tests between the mills and the Laboratory.*—Good progress has been made in this investigation during the year under review. The mills in Bombay were circularised by the Secretary, Millowners' Association requesting them to collaborate with the Laboratory by sending suitable samples of lint, scutcher lap, card-sliver, draw-frame sliver and roving bobbins for carrying out comparative tests and for ascertaining the stage or stages at which the differences arose between the Laboratory tests and the mill tests. In response to this circular 12 samples were received from 9 mills. Of these, tests have already been completed and the results analysed for 9 samples.

(4) *Detailed study of the fibre properties of cottons showing abnormal behaviour in spinning.*—This problem is being studied by Mr. Hari Rao Navkal, and during the period under review he examined about 30 more samples for swollen hair diameter and fibre maturity, bringing the total number of samples examined in connection with this investigation to about 120. Since sufficient data was available, these samples were divided into four broad classes on the basis of their fibre-properties. The first group

consisted of inferior Indian cottons which generally spin below 20's standard warp counts. The fibre diameter in the case of these cottons proved a good criterion for deciding whether or not a cotton belonged to this class, but the effect of fibre-diameter on the spinning value for this particular class was not so great as that of fibre-weight per inch. The regression equation which was worked out for this class predicts the spinning value much better than the general formula worked out for the standard Indian cottons, and therefore it represents a distinct advance in our ability to predict the spinning value of the comparatively short staple cottons. The second class consisted of foreign cottons grown in India, and in their case it has been found that fibre-weight per inch plays a relatively less important role than fibre-diameter. This is presumably due to the fact that the fineness (by weight) of the cottons falling in this class is very often associated with low fibre maturity. The regression coefficient worked out for these cottons also fitted better than the general equation previously obtained for the standard Indian cottons, and it has been further observed that wherever large differences occur between the actual and the calculated values, they could generally be explained by taking fibre-length irregularity into account. Thus, in the case of these cottons as well, an advance has been made in our ability to predict their spinning performance from their fibre-properties. The third group consisted of all the other good-quality cottons grown in India except those belonging to the Surat-Broach tract. It was found that in the case of these cottons there was greater uniformity in fibre-weight per inch and swollen diameter, and the new regression equation did not represent any notable improvement over the old formula derived for the standard Indian cottons. It was, however, observed that the cottons falling in this group generally gave a better spinning performance than that expected from them on the basis of their fibre-properties, and, therefore, by applying a small correction a fairly good estimate of their spinning performance can also be made. The fourth and the last group consisted of strains peculiar to the Surat-Broach tract. The number of these strains studied in detail for their fibre-properties is not yet enough for the application of statistical methods, and, therefore, more strains are being examined to enable a new regression equation to be worked out which may be applicable to cottons grown in this tract.

It may be stated in this connection that a paper giving a review of the work done at the Laboratory on the important problem of predicting the spinning value of Indian cottons from their fibre-properties was prepared by the writer during the period under review and was read at the Second Conference of Scientific Research Workers on Cotton in India held in Bombay in January last. A short summary of this paper will be found under the head " Publications."

(5) *Effect of storage under Bombay conditions on quality of Indian cottons.*—This investigation, which had been entrusted to Mr. C. Nanjundayya, was nearly completed during the period under review. The samples from the 5th and final drawing were taken out and subjected to tests for fibre-strength, yarn-strength, lustre and copper number. A preliminary analysis of the data has been carried out, and it shows that the yarn-strength

tends to increase after 6 months' storage from May to October, but that there is a fall in the subsequent drawing after another 6 months' storage, and that thereafter the values for the 4th and 5th drawing, each taken at intervals of 6 months, are nearly the same as those of the 3rd drawing. It is further found that the fibre-strength shows a mild tendency to decrease with storage, while the lustre also shows a similar tendency and is less for the bales stored for 2 years as compared with the new cottons. The copper number, on the other hand, showed an erratic behaviour registering an increase in the case of samples drawn after the monsoon, and the causes responsible for this erratic behaviour are now being investigated.

(6) *Relationship between wax content, feel and fibre-weight per inch of cotton.*—This problem is also being studied by Mr. Nanjundayya. It had been previously established that the feel of a cotton, as estimated by the Grader, is closely related to the amount of wax present on the fibres, which can be determined quantitatively. It had further been observed in a general way that the amount of wax present on the fibres is related to the fineness of the fibres as measured by their fibre-weight per inch or fibre diameter. In order to study this relationship more closely the standard Indian cottons of the 1937-38 and 1938-39 seasons have been examined for fineness and wax content percentage, and it has been found that although in a majority of cases a definite relationship can be established between the three characteristics, some cases give abnormally large differences between the actual and predicted values and experiments are now in progress to find out the causes for the abnormal behaviour of these cottons.

(7) *Influence of swollen hair-diameter on the spinning quality of cottons with special reference to Arboreum cottons.*—This problem is being studied by Mr. R. S. Koshal. For the purpose of this investigation 42 samples were kindly supplied by the Geneticist, Institute of Plant Industry, Indore. These belong to 7 varieties grown in six randomised blocks. Since the produce from each block was sufficient only for fibre tests, these were carried out on the 42 samples, but the spinning tests were performed on only 7 samples by mixing the produce of the six randomised blocks for each variety. All the fibre tests and spinning tests have been completed, and they have shown that the block-to-block variation in this case is non-significant, that the Jarilla cotton gave the lowest value of swollen hair-diameter, fibre-weight per inch and standard hair-weight and these factors are reflected in its spinning performance which was highest among these seven cottons. The detailed analysis of these results by applying analysis of variance and co-variance is now in progress. It may, however, be stated that the number of samples so far received for this investigation is very small, and it would really be very useful if a large number of samples grown according to a definite plan could be supplied to the Laboratory for the purpose of this investigation.

(8) *Fibre-properties in relation to seed-characters.*—This problem is being investigated by Mr. A. N. Gulati, who is using the seeds of P. A. 4F and P. A. 289F/43 grown at Lyallpur with three different irrigations and two rotations. P. A. 4F was found to contain 5 different types of seed, namely,

brown naked, brown sparsely fuzzy, black naked, black sparsely fuzzy and grey fuzzy. The fibre-properties of lint obtained from 20 seeds of each type grouped together have been studied, while the fibre tests have also been made on 50 individual seeds. It has been found that brown type of seeds which constitute, over 50 per cent. by number of the total number of seeds, bears immature lint, while the black and the grey types bear higher percentages of mature lint. It has further been found that the degree of maturity in the seed as well as the lint growing on it is changed by the amount of irrigation, the immature seeds tending to lessen with the heavier irrigations. Further, the lint from the brown seeds was found to be inferior to that from the black seeds, while the latter was somewhat inferior to that of the grey seeds. The effects of different irrigations and rotations in altering the relative proportions of these seeds and modifying the properties of the lint growing on them are now being studied.

As against the seeds of P. A. 4F, those of P. A. 289F/43 were found to be similar in appearance and they were classified in 3 groups in respect of their size. A study of their fibre-properties showed that the heavier seeds which possessed a lower ginning percentage produced longer lint characterised by higher fibre-weight per inch and higher fibre-maturity as compared with the lint obtained from lighter seeds. Further experiments are in progress on the various types of seeds and the effect of irrigation and rotation on the fibre-properties of lint produced on them. As these tests are not yet completed, the above-mentioned results should be regarded as tentative.

(9) *Determination of constants for finding out the standard hair-weight of Indian cottons.*—This investigation has been entrusted to Mr. R. L. N. Iyengar. The importance of standard hair-weight is becoming daily more evident, but the constants so far for calculating its values for Indian cottons are those found elsewhere for the Empire cottons. As it is possible that these constants may be different for the Indian cottons, this investigation is being undertaken to ascertain their exact values. In the first place an examination was made of four different methods which could be used for ascertaining these constants, and after carefully weighing their relative merits, it was decided to determine the fibre-maturity by the two methods, namely, (1) swelling in caustic soda and (2) by polarised light, and measuring the diameter of the swollen fibre as well as the diameter of the lumen. From these observations the ratio of the volume of cellulose in the fibre to the volume of the fibre when it is completely ripe can be calculated, and these results give the distribution as well as the mean value of the ratio in each of the three maturity classes. From the mean values the constants for the calculation of the standard hair-weight can be obtained. So far these tests have been completed on 3 strains, while they are in progress on a fourth strain. Hitherto, the strains selected have been those which possessed nearly normal percentage of mature fibres, but it will be necessary to extend these observations to many more strains including those which possess abnormal values of mature and immature fibres.

(10) *Variation in fibre-strength and bacterial infection at different humidities.*—This investigation, which had been entrusted to Mr. Gulati, was completed during the year under review and a paper giving the detailed results as well as the conclusions drawn was read before the Second Conference of Scientific Research Workers on Cotton in India which was held in Bombay in January last. A summary of this paper will be found under the head ' Publications.' It will be seen from this summary that the important observations have been made that the bacterial and fungal growths in a cotton are mainly responsible for its deterioration, and that these growths take place only if localised watering has been resorted to giving rise to conditions favourable for the multiplication of these micro-organisms. Even if the sample is afterwards stored in a bone-dry atmosphere, this deterioration proceeds apace, though its rate is accelerated if the sample is stored in a damp atmosphere. On the other hand, if no localised watering has been resorted to, but the sample is kept in a fairly high humidity reaching to 90 per cent. R. H., no appreciable deterioration in its strength takes place, although a certain amount of discolouration with time is noticeable. These tests bring out the relatively great harm done by even small quantities of localised watering as compared to high humidity, to which must be added the clustering of fibres under pressure in a matted and knotty condition.

(11) *Efficiency of kier boil and bleach treatments and comparison of kier boil with different concentrations.*—The investigation on the effect of different treatments of kier boil and bleach on the strength and appearance of yarns spun from 4 good quality Indian cottons has been completed and during the period under review a bulletin on this subject was sent up for publication in the Journal of the Indian Chemical Society. Arising out of this investigation, another investigation was undertaken to study in greater detail the effects of certain treatments which were rather obscure in their effects especially those of the open boil in the kier and bleach with different concentrations of the bleach liquor and different durations of the bleaching period. For this purpose 60 different samples have been prepared with different treatments of kier boil and bleach at the Department of Chemical Technology, University of Bombay, who are collaborating with the Laboratory in this work, and out of these, tests have so far been completed on 10 samples of yarn. The remaining samples are under test, and when the results are available they will be analysed.

(12) *Alternative uses of cotton.*—(*a*) *Cotton bags for storing sugar.*—A number of cotton bags of the type required by merchants for storing sugar were prepared through the courtesy and assistance of a local mill. Experiments were carried out to find a cheap and efficient water proofing treatment which could be applied to these bags, as it had been reported that the chief objection to storing sugar in cotton bags was their permeability to moisture as a result of which the grade and quality of the stored sugar deteriorated with time. [After making trials with several treatments, it was found that two treatments (*a*) dilute solution of aluminium acetate (3°TW) and (*b*) aluminium acetate followed by padding with 1 per cent. crude tannic acid

were most efficient consistent with cheapness. These treatments were applied to two lots of bags which have now been sent to the Director, Imperial Institute of Sugar Technology, Cawnpore, for making observations on sugar stored in them. [The report from the Director of the Institute is awaited.]

(*b*) *Filter cloth for sugar factories.*—As agreed upon in an informal conference between the Directors of Lac Research Institute, Ranchi, Imperial Institute of Sugar Technology, Cawnpore, and the Technological Laboratory, Matunga, which took place some time ago, samples of filter cloth ordinarily used in the sugar factories were received either through the Indian Sugar Mills Association or with the kind assistance of the Director, Imperial Institute of Sugar Technology. Seven of these samples were obtained from the sugar factories, one from a local cotton mill and the remaining 4 were of foreign make. These were examined for their shrinkage properties, strength and construction. They were found to show a wide variation in shrinkage, ranging from 4.25 to 10.08 per cent. in the warp direction and from 2.41 to 5.16 in the weft direction. Among these, only 3 samples, one imported, one manufactured in a local mill, and the third received from a sugar factory, gave very satisfactory results as regards strength and shrinkage, while one imported sample and one sample from a sugar factory gave very poor results as regards these characteristics. The remaining 7 samples may be said to have given fairly satisfactory results, and it was found that a sample having 3-ply 57 ends and 7-ply 39 picks and a high twist in the warp yarns gave the best results. It would be very useful if cloth of different constructions, as indicated by the results of these experiments, could be prepared from a few varieties of cottons to find out which particular types of cloth give the best results.

The two above-mentioned investigations were carried out by Mr. D. L. Sen.

(*c*) *Use of cotton fabrics in road construction.*—During the period under review arrangements were made on the one hand with the Bombay Municipality for collaborating in this experiment and, on the other hand, with one of the local mills, which very kindly came forward with willingness to prepare the type of cloth required for this purpose. The cloth used in this experiment is of an open-weave type and has 13 picks and 14 ends per inch and is woven from 3.17's warp and 3.75's weft yarns with a weight of 5.71 ozs. per square yard. The Bombay Municipality, it is understood, construct two kinds of roads, one in which the surfacing material is mixed mechanically and in the other with hand. It was decided to carry out the experiments on both types of road, and in each case a length measuring 500 feet was constructed using the cotton fabric while an equal and contiguous length of road was constructed without the cotton fabric. The roads constructed with and without cotton fabric as a reinforcing material will now be kept under observation by the staff of the Municipality, whose report on this subject is awaited. It may further be mentioned that 20 cotton mats have also been prepared and these

are being used for curing some of the cement roads constructed by the Municipality. Their report showing the relative merits of these mats as compared with the materials used by them in the past will be received in due course. In this connection, I have to thank Mr. N. V. Modak, the City Engineer, Bombay Municipality, for kindly agreeing to collaborate in this investigation and Mr. N. F. J. Bilia for the keen interest taken by him in carrying out these experiments. I have also to thank the mill referred to above for the valuable help rendered by them in preparing the cloth according to specifications.

(*d*) *Cotton cloth cover for cotton bales.*—This investigation has been undertaken in pursuance of the decision of the Committee at its last meeting, and is being carried out by Mr. C. Nanjundayya. For this purpose, two bales each of P.A. 289F and Cambodia Co.2 have been received, one bale of each cotton being covered with the ordinary hessian cloth and the other with cotton fabric. The fabric used for covering the 289F bale was prepared in one of the Northern India mills, while that used for covering the Cambodia bale was manufactured in a Southern India mill. These bales have been stored, with their kind permission, in the godown of Messrs. Bachhraj & Co., Bombay, and fortnightly readings of their weights and general appearance are being taken, while daily record of the wet and dry bulb temperature prevailing in the godown is also being maintained.

(13) *Work on Indian linters.*—This work is being done by Dr. L. Thoria. During the period under review 24 samples of Indian linters of the 1939-40 season, which had been analysed previously in the Shirley Analyser, were subjected to chemical treatments, which consisted of pressure boil in an autoclave followed by chlorine bleach treatment. The resulting chemical cotton was examined for its alpha-cellulose content and ash content. The samples of linters were also graded by the method of surface grading with the kind assistance of Messrs. R. G. Saraiya and Nanavati. It may be mentioned that each method of examination, namely, mechanical, chemical and surface grading brought out the interesting fact that the linters of 1939-40 season were much superior to those of the previous season showing that a distinct improvement had taken place in the production and marketing of Indian linters within the short space of a year. The experimental data, given by chemical and mechanical treatments of 39 samples of Indian linters belonging to two seasons, was analysed ; and it was found possible to evolve a simple formula for predicting, with a reasonable degree of accuracy, the alpha-cellulose content of a sample of linters from the results of its mechanical analysis. Applying this formula to the material available, it was found to give close agreement in a majority of cases ; and a new method of grading linters, based on the alpha-cellulose content of the sample, has been proposed in the report which has been prepared on this subject. With a view to testing the correctness of this formula and to laying down sound standards for the grading of Indian linters, the standard grades of American linters, which had been received sometime back, are now being subjected to mechanical and chemical analysis. This work is now in progress.

In addition to the above-mentioned work, a study of the effect of hydrogen-ion concentration on the bleaching of kier boiled linters was continued during the period under review. It was found that in the acid region the degree of whiteness achieved is low inspite of high consumption of chlorine. It was further found that there appears to be a certain pH value at which a high degree of whiteness can be achieved for comparatively low chlorine consumption and the effect is further accentuated if this particular pH is attained by using sodium bicarbonate as a buffer. Further aspects of this problem are being studied.

V. GINNING SECTION.

The period covered by this report has witnessed the inauguration of a new section at the Laboratory, namely Ginning Section, which commenced work on the 21st April 1941. Since the existing building of the Laboratory was not sufficient to accommodate the new machinery ordered out for this Section, it was necessary to construct a new wing adjoining the Spinning Room. The new wing constructed for this Section covers an area of 1,732 sq. ft. and consists of a large room in which the machinery is installed and a store room measuring 150 sq. ft. for keeping the samples. The building work started in September 1940 and was finished in January 1941. As soon as the building was ready, the erection of machinery was taken in hand and this was completed in April 1941.

The following machines which had been ordered for this Section on the recommendation of a small Expert Sub-Committee, were duly erected :—

(1) One Platt Brothers Double Cylinder Seed Cotton Opener 50″ wide, with fan for updraught and delivery lattice, complete with one set (5 per set) gearing straps and one set of screw keys and screw driver.

(2) One Improved Little Convertible F.E.C. Extracting and Cleaning Machine.

(3) One 5-Cylinder I-Type Cleaner, 2″ spikes, 50″ width manufactured by Messrs. Harwick-Etter Co., U.S.A.

(4) One 40 saw Air Blast Gin together with accessories manufactured by Messrs. Centennial Cotton Gin Co., U.S.A.

(5) One Volkarts New Patent Double Roller Gin.

(6) One Double-Acting Single Roller Macarthy Gin, 40″ wide, manufactured by Messrs. Platt Brothers & Co., Ltd., Oldham, England.

In addition, one double-roller gin manufactured by Messrs. Platt Brothers & Co., Ltd., England, which was purchased in 1932 and was available at the Laboratory was also re-erected in this room.

The work of constructing the building, erecting the machinery and equipping the Section with the necessary fittings was carried out at the same time as the other activities of the Laboratory were maintained at a higher speed than ever before. In this work the writer received the help of several firms and people and he would particularly like to record his thanks to Messrs. Volkart Brothers and their engineers and Messrs. B.E.S.T. Co., Ltd., for the very valuable assistance kindly given by them. He would also like to place on record his appreciation of the Spinning Master's help in erecting the machinery. The capital cost of this Section including building, machinery, equipment, etc., has come to about Rs. 33,500.

It will be seen from the above account that the new Ginning Section is fairly well equipped, containing three types of opening and cleaning machines and three types of gins for experimental work. It cannot be said that the equipment is complete in every respect, as it may be necessary to add some more machines to it as the work in this Section develops, but it can be stated that it forms a good nucleus for work on improvement of ginning of Indian cottons and for investigating the problems facing our ginning factories.

As soon as the machines had been erected and were found to be in working order, the experiments on the ginning of Indian cottons were undertaken according to the programme previously approved by the Committee. For this purpose sufficient quantities of the following 8 varieties of seed cotton were obtained :—

List of cottons.

1.	1027 A.L.F.	5.	Sind Sudhar
2.	P.A. 289F/43.	6.	Verum
3.	P.A. 4F	7.	K. 25.
4.	4F/98	8.	Tandojan Mohammad

The plan followed in these tests was broadly as follows. Each variety of *kapas* was opened on each of the 3 opening machines in duplicate lots, wherever the quantity permitted. This experiment would give information regarding the opening and cleaning efficiency of the three machines with respect to different varieties of seed-cotton. The opened seed-cotton from two of the machines was ginned in several lots in the saw-gin with different speeds of the saws and in some cases with different rates of feed. The opened seed-cotton from two machines was ginned in the double-roller gin with different overlaps and in the single-roller gin with different overlaps and speeds. Records were maintained of temperature and humidity, the time taken for the passage in each machine, the power consumed by each machine, the weights of the material before and after passage in each machine, the visible and the invisible loss, the weight of lint, seed and trash, etc. The ginning experiments were completed on 6 varieties of seed-cotton before the monsoon set in, when the work was stopped in the Section. During this period of the monsoon the samples obtained with the different cleaning and ginning treatments will be examined for their fibre properties and spinning performance, while work in the Ginning Section will be resumed after the monsoon when the drier climatic conditions are restored in Bombay.

VI. MOISTURE TESTING SECTION.

During the year under review the tests for the determination of moisture content of cotton, yarn and cloth were carried out on 306 samples as detailed below :—

(1) Technological samples 24

(2) Trade samples 282

The total number of samples tested in this Section since its inception in 1931 is 1,462.

The figures given above do not include the 171 samples of coir yarns for which the moisture content was also determined during the period under review.

VII. PUBLICATIONS.

The following publications were issued from the Laboratory during the period under review :—

1. *Technological Bulletins, Series A, Nos.* 51 *and* 52.

   (1) Technological Bulletin, Series A, No. 51 " Technological Reports on Trade Varieties of Indian Cottons, 1940 " by Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F.Inst.P., J.P.

   (2) Technological Bulletin, Series A, No. 52 " Technological Reports on Standard Indian Cottons, 1940 ". by Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F.Inst.P., J.P.

2. *Technological Bulletin, Series B, No.* 30. " A Study of the Effects of Environment on Fibre Maturity of Cotton " by A. N. Gulati, M.Sc.

3. *Technological Circulars :*

List of Technological Circulars Nos. 440-474 (*inclusive*).

Circular No.	Title.	Date of publication.
440	Spinning Test Report No. 1200 on Hubli Kumpta Cotton, 1939–40	June 1940.
441	Technological Report on Surat 1027 A.L.F., 1939–40 ..	,, ,,
442	Technological Report on Cambodia Co. 2, 1939–40	,, ,,
443	Spinning Test Report No. 1203 on samples of Jagadia cotton, 1939–40	,, ,,
444	Technological Report on Jayawant (Kumpta) cotton, 1939–40	July 1940.
445	Technological Report on P.A.4F cotton, 1939–40	,, ,,
446	Spinning Test Report No. 1208 on samples of Kadi cotton, 1939–40..	,, ,,

Circular No.	Title.	Date of publication.
447	Spinning Test Report No. 1209 on samples of Bawla cotton, 1939–40	July 1940.
448	Spinning Test Report No. 1210 on samples of Karunganni cotton, 1939–40	,, ,,
449	Technological Report on Punjab-American 289F cotton, 1939–40..	Aug. 1940.
450	Spinning Test Report No. 1220 on samples of A. R. Kampala, 1939–40..	Sept. 1940.
451	Spinning Test Report No. 1221 on samples of A. R. Jinja, 1939–40..	,, ,,
452	Spinning Test Report No. 1223 on samples of Jayawant cotton, 1939–40	,, ,,
453	Spinning Test Report No. 1267 on samples of P.A. 289F/43 cotton, 1940–41	Jan. 1941.
454	Spinning Test Report No. 1268 on samples of Verum cotton, 1940–41	,, ,,
455	Spinning Test Report No. 1271 on samples of C.P. No. 1 cotton, 1940–41	Feb. 1941.
456	Technological Report on Jarilla cotton, 1940–41	,, ,,
457	Spinning Test Report No. 1275 on samples of Berar cotton, 1940–41..	,, ,,
458	Spinning Test Report No. 1276 on samples of P.A. 289F cotton, 1940–41	,, ,,
459	Technological Report on Umri Bani cotton, 1940–41 ..	,, ,,
460	Spinning Test Report No. 1278 on samples of P.A. 4F, 1940–41..	,, ,,
461	Spinning Test Report No. 1280 on samples of Latur cotton, 1940–41..	,, ,,
462	Spinning Test Report No. 1287 on samples of Sind Sudhar Cotton, 1940–41	March 1941.
463	Technological Report on Verum 262 (Akola) cotton, 1940–41	,, ,,
464	Technological Report on Verum 434 (Akola) cotton, 1940–41	April 1941.
465	Spinning Test Report No. 1311 on samples of Gaorani 6 cotton, 1940–41	May 1941.
466	Spinning Test Report No. 1312 on samples of Khandesh cotton, 1940–41	,, ,,
467	Spinning Test Report No. 1313 on samples of P.A.L.S.S. cotton, 1940–41	,, ,,
468	Spinning Test Report No. 1317 on samples of Farm Westerns cotton, 1940–41	,, ,,
469	Spinning Test Report No. 1319 on samples of Miraj cotton, 1940–41..	,, ,,
470	Spinning Test Report No. 1320 on samples of Hubli Kumpta cotton, 1940–41	,, ,,
471	Spinning Test Report No. 1321 on samples of Hubli Upland cotton, 1940–41	,, ,,
472	Spinning Test Report No. 1322 on samples of Westerns cotton, 1940–41	,, ,,
473	Spinning Test Report No. 1323 on samples of Broach cotton, 1940–41	,, ,,
474	Spinning Test Report No. 1324 on samples of Bailhongal cotton, 1940–41	,, ,,

In addition, the following two papers were read at the Second Conference of Scientific Research Workers on Cotton in India which was held in Bombay in January 1941 :—

(1) "A Review of the Position regarding Relation of Fibre Properties to Spinning Performance of Indian Cottons" by Nazir Ahmad, O.B.E., Ph.D., F.Inst.P., J.P.

(2) "The Effect of Storage, under certain specified conditions, on the quality of Indian cottons," by Nazir Ahmad, O.B.E., Ph.D., F.Inst.P., J.P., and A.N. Gulati, M.Sc.

Furthermore, a joint paper by B. M. Dabral and Nazir Ahmad entitled "Effect of different types of irrigation on the growth, yield, fibre-properties and spinning quality of 4F (Sind) and Sind Sudhar cottons" was written up and sent to the Imperial Council of Agricultural Research for publication.

Summaries of the Technological Bulletin, Series B, No. 30 and of the three papers referred to above are given below :—

Technological Bulletin, Series B, No. 30, "*A Study of the Effects of Environment on Fibre-maturity of Cotton.*"—The effects of environment, as provided by agronomical factors, on fibre-maturity of cotton, for which material was kindly supplied by the Institute of Plant Industry, Indore, is described in this paper.

The material consisted of two sets of samples. The first set consisted of samples of P. A. 289F and Mollisoni cottons grown at Sriganganagar (Bikaner). The agronomical factors included in this experiment were (*i*) Sowing dates in May and June, (*ii*) presence and absence of preparatory cultivation, (*iii*) heavy and moderate irrigations, (*iv*) cake, nicifos and no-manure, and (*v*) six and twelve inch spacings. From a study of these results the following conclusions are drawn which should be regarded as tentative owing to the small number of samples in this set :—

(1) Out of the two sowing dates, May suited P.A.289F, while June helped Mollisoni to attain its highest fibre-maturity.

(2) Preparatory cultivation consisting of fallow in *Kharif* and wheat in *Rabi* repeated over two years, did not prove beneficial to either of the two cottons in respect of fibre-maturity.

(3) Heavy irrigation comprising eleven waterings as compared to moderate irrigation of six waterings was helpful in raising the fibre-maturity of both cottons. Heavy irrigation with May sowing formed a good combination for P.A.289F.

(4) The application of Nicifos to P.A.289F was evidently better than no-manure when the cotton was sown in May, while cake and no-manure suited Mollisoni better than Nicifos.

(5) Six-inch spacing as compared with twelve-inch spacing improved the fibre-maturity of Mollisoni.

The second set consisted of samples of Cambodia cotton grown in two Rajputana States—Bundi and Ajmere. The agronomical factors studied in this experiment were :— (*i*) three sowing dates in March, May and July, (*ii*) adequate and scanty irrigations, (*iii*) presence and absence of basal dressing of manure and (*iv*) three top dressings of manure. The following conclusions are drawn from the results :—

(1) Locality has a significant effect upon maturity percentage—Ajmere yielding higher percentage of mature fibres as compared with Bundi.

(2) *Sowing dates.*—The earlier sown samples gave higher percentages of maturity in both the localities. Thus sowing in March proved the best and sowing in July the worst period in respect of this property. The bad effects of late sowing could, however, be remedied by heavy irrigation.

(3) *Irrigations.*—Adequate irrigation yielded higher fibre-maturity than scanty irrigation.

(4) *Basal dressing.*—The application of sheep dung at the rate of 32 mds. per acre plus Ammonium sulphate at the rate of 50 lbs. per acre as basal dressing had a depressing effect upon fibre-maturity as compared with no basal dressing.

(5) *Top dressing.*—Top dressings with sheep dung alone (T2) and sheep dung plus Ammonium Sulphate (T3) as compared to no top dressing (T1) had a beneficial effect upon maturity percentage, T3 giving better results than T2. Thus, application at the same rate of the same manure, i.e., sheep dung plus Ammonium Sulphate did not prove beneficial as a basal dressing but proved beneficial when applied as a top dressing.

Paper entitled "The Effect of Storage, under Certain Specified Conditions, on the Quality of Indian Cottons."—The present paper gives an account of the effect of storage, under certain specified conditions, on some of the important properties of Indian cottons. The conditions of storage were, (1) Bombay weather, (2) controlled humidities at room temperature and at a constant temperature, and (3) controlled humidity combined with watering of cotton. The characters studied were (1) fibre-strength, (2) incidence of infection, and (3) shade of cotton. In addition, tests were also made on fibre length, fibre-weight per inch and the spinning quality of the cotton. The following conclusions are drawn from the results :—

(1) Broach Deshi 8, when stored in Bombay for $2\frac{1}{2}$ years in the form of a bale, showed distinct signs of deterioration in quality, as indicated by the following features : (*a*) decrease in staple length, which, unless it was due to sampling, could be attributed to the internal corrosion of the fibres which

helped in their rupture in repeated opening and re-pressing of the bale; (*b*) increase in the number of yarn breakages in the ring frame ; (*c*) a downward trend in yarn strength, and (*d*) increase in fungal damage to fibres. The extensibility of the yarn was found to increase slightly with storage of cotton.

(2) Storage in desiccators at controlled humidities below 90 per cent. R.H. did not lead to any deterioration in bundle-strength over a period of two years, but at saturated humidity the deterioration was so rapid that both Broach Palej and Broach Deshi 8 decayed completely in 4 to 5 months.

(3) Storage at humidities immediately above 90 per cent. R.H. resulted in loss in strength, the loss being more rapid at higher than at lower humidities. Thus, the critical limit lay between 90 per cent. and 92 per cent. R.H. The rate of decay increased even with a small increase in storage humidity above 90 per cent. R.H.

(4) The incidence of infection was significantly lower for Broach Deshi 8 than for Broach Palej, and there was a significant increase in the percentage of infected fibres in samples stored at 75 per cent. R.H. and higher humidities.

(5) Broach Deshi 8 was slightly whiter in shade than Broach Palej ; the shade remained unaffected in storage at 60 per cent. R.H. and 75 per cent. R.H. for a period of two years, but at 90 per cent. R.H. and higher humidities the shade of both cottons deteriorated gradually.

(6) Strength tests on small samples stored for two years in Petri dishes for shade measurements showed that even at 75 per cent. R.H. there was a loss in strength especially in the lower half of the sample. The reason for this loss in strength, which was not shown by the samples stored in desiccators, was found in the accumulation of moisture in the samples in the Petri dishes.

(7) Storage for 1½ years at different humidities and a constant temperature of 92°F., did not lead to any decrease in strength or increase in incidence of infection, showing the important role of temperature as a controlling factor for fungal growth. The success of a comparatively low temperature in arresting fungal growth was probably due to absence of any water in the desiccators. This result brings out the importance of storing the cotton in a dry godown.

(8) When cotton is wetted with localised watering as by the sprinkling or spraying of water, it always results in a loss in strength and shade in the damped region. The loss in strength increases rapidly with the humidity of the atmosphere in which the cotton is stored, and it generally goes hand-in-hand with increase in fungal infection of fibres. The evil effects of adding water to cotton before pressing it on the ground that dry cotton would not press well, are clearly brought out by these results.

(9) Addition of 0.5 per cent. to 1 per cent. of Formalin of correct commercial concentration to water was found to be quite efficacious in checking the deterioration of cotton on storage. We must, however, make it quite clear that we are not at all in favour of watering cotton in any form whatever, but, if it is indispensable, its evil effects can be greatly reduced by the use of the above-mentioned antiseptic.

Paper entitled " A Review of the Position Regarding Relation of Fibre Properties to Spinning Performance of Indian Cottons."—In this review we have shown how beginning with single fibre properties the basis of the investigation was gradually widened until half a dozen fibre properties were taken into account. This work, apart from yielding a very useful prediction formula, illuminated the field so as to bring into prominence those fibre properties which exercised the greatest influence in determining the spinning quality of Indian cottons. The relatively unimportant fibre properties fell into the background, and in their place the influence of other fibre properties was investigated in detail, with the result that some of these fibre properties were found to be quite important from the above-mentioned point of view. Both these investigations, however, revealed the existence of a certain percentage of cottons whose actual spinning performance was much above or below the value predicted from their fibre properties. A detailed study of these 'abnormal' cottons has indicated the desirability of dividing the Indian cottons into four groups, each group possessing certain characteristic fibre properties. Separate regression equations have been fitted to two of these groups, which give closer agreement with the actual spinning performance than the general formula evolved from a consideration of all the cottons. This work is now in progress, and gives promise of taking us one step further in the solution of this fascinating but difficult problem.

Effect of different types of irrigation on the growth, yield, fibre properties and spinning quality of 4F (Sind) and Sind Sudhar cottons.—Investigations on the water requirements of the cotton crop in Sind were carried out and the samples grown were subjected to fibre and spinning tests. Data on several aspects of the problem, e.g., effect of varying the distribution of water during growth, on final yield, fibre properties, etc., have been presented and discussed in this paper.

After experimenting with a number of different methods of distribution of water during growth, one particular system, where water was given at longer intervals during the vegetative stage of the cotton crop, but more frequently during the flowering and boll-setting stage, has given a balanced growth rate, slightly higher per cent. of setting of bolls from flowers and a significant increase in yield per unit area. This method of irrigation has been named as the " Declinary system " and recommended for adoption by the cotton cultivators in Sind.

The results of fibre and spinning tests show that the different irrigation treatments employed in this experiment did not produce any appreciable effect on fibre length or fibre weight per inch. They did, however, produce

some effect on fibre-maturity, yarn neppiness and yarn strength, for which, on the whole, the declinary system No. III gave slightly better results than the other treatments among which, the zamindari system II was found to be associated with relatively high waste losses and poor yarn-strength.

VIII. GENERAL.

Visitors.—During the period under review a large number of people connected with administration, textile research, trade and industry visited the Technological Laboratory. Among them the following may be mentioned :

(1) The Director-General of Supply, New Delhi.
(2) The Controller of Supply, Bombay.
(3) The Chief Controller of Stores, New Delhi.
(4) J. S. Bozman, Esq., C.I.E., I.C.S., Department of Health, Education and Lands, New Delhi.
(5) The Secretary, Imperial Council of Agricultural Research, New Delhi.
(6) The Chairman, Millowners' Association, Bombay.
(7) Sir Datar Singh, Member, Imperial Council of Agricultural Research, New Delhi.
(8) F. G. Hickman, Esq., Editor and Publisher, The Cotton Trade Journal, New Orleans, U.S.A.
(9) The Director of Agriculture, Uganda, East Africa.
(10) Mr. C. P. Dalal, Managing Director, Messrs. Narandas Rajaram & Co. (Africa), Ltd., Kampala.
(11) E. W. Strickland, Esq., Member, Roger Mission.
(12) The Principal, Government Institute of Dyeing and Calico Printing, Lahore.
(13) Students of the Agricultural College, Poona.
(14) Students of the Kala Bhavan Institute, Baroda.
(15) Students of the Seth D. M. Agricultural Institute, Baroda.
(16) Students of the S. K. S. J. Technological Institute, Bangalore.
(17) Students of the V. J. T. I. Textile Association, Matunga.
(18) Students of the Government Central Textile Institute, Cawnpore.
(19) Students of the Allahabad Christian College, Allahabad.
(20) Members of the Technological Association of the Department of Chemical Technology, Bombay.

The Technological Assistants working at the mofussil laboratories attended the Laboratory in November-December 1940, for refresher course and the conference of Technological Assistants with the senior research staff of the Laboratory which was held on the 6th and 7th December 1940.

Equipment.—The equipment added to the new Ginning Section of the Laboratory has already been dealt with on page 26. In addition the following apparatus and accessories were added to the equipment of the Laboratory :—

(1) One Shirley Moisture Tester manufactured by Messrs. The Record Electrical Co., Ltd., England.

(2) One high power Arc Lamp with rectifier for measuring the fastness to light of dyed fabrics and yarns manufactured by Messrs. The Strong Electric Corporation, New York.

(3) One Wide Range Incubator, electrically heated, with a range of 20° C. to 80° C. manufactured by Messrs. Baird and Tatlock, (London) Ltd., England.

(4) Material for converting one side of the ring frame from 3 rollers to high drafting system manufactured by Messrs. Tweedales and Smalley (1920), Ltd., England.

In addition, one of the two carding engines in the Spinning Laboratory was re-clothed during this period. Furthermore, a small pilot plant for estimating the alpha-cellulose content of raw materials, which had been sanctioned by the Board of Scientific and Industrial Research for the investigation to be carried out at the Technological Laboratory, was received during this period.

Staff.—Full details of the technical staff employed at the Laboratory are given in Appendix II, while the details relating to leave, transfer, temporary appointments, etc., are given below.

Leave.—The writer proceeded on leave on medical grounds from the 25th July 1940, to the 24th August 1940, and during this period Mr. D. L. Sen, Senior Research Assistant, supervised the work of the Laboratory.

Mr. N. Hari Rao, Senior Research Assistant, proceeded on leave from the 5th May 1941 to 21st June 1941, and is expected to return to duty on the 22nd June 1941.

Mr. V. V. Gupte, Spinning Master, proceeded on leave from the 15th April 1941 to 17th May 1941, and during his absence Mr. A. G. N. Iyengar officiated as Spinning Master.

Mr. V. Venkataraman, Statistician and Personal Assistant, proceeded on leave from the 15th April 1941 to the 24th May 1941.

Mr. A. N. Gulati, Microscopist, proceeded on leave from the 13th January 1941, to the 7th February 1941.

Transfers and appointments.—On account of the increase in the work of the Laboratory, especially in the Testing House Section, a new post of Superintendent of the Testing House was created for one year, in the first instance, by the Committee at its meeting held in August 1940. Mr. D. L. Sen, Senior Research Assistant, was appointed to this post with effect from the 11th December 1940.

Mr. Srinagabhushana, Junior Research Assistant, accepted the appointment of Assistant Professor of Textile Testing at the Shri Krishna Rajendra Silver Jubilee Technological Institute, Bangalore, and was relieved from the Laboratory on the 1st September 1940. The post was filled up by the transfer of Mr. R. L. N. Iyengar, Technological Assistant at Coimbatore, who took up his duties at the Laboratory on the 20th March 1941.

The post of the Technological Assistant vacated by Mr. Iyengar was filled up by transfer of Mr. K. S. Marar, Junior Tester, who had previously held the post of Technological Assistant, Sakrand. Mr. Marar was relieved on the 1st March 1941, and Mr. N. C. Chiplonkar, Temporary Junior Tester, was appointed officiating Junior Tester vice Mr. Marar with effect from the 1st March 1941.

Mr. G. J. Kharkar, Junior Tester, has continued to be on military duty since the 29th February 1940 and it is pleasing to record that he now holds a Captain's commission in the Indian Territorial Force. Mr. S. Ramanathan was appointed officiating Junior Tester with effect from the 1st August 1940.

Mr. R. B. Joshi was appointed as Junior Tester with effect from 17th June 1940 *vice* Mr. S. Samson transferred to Cawnpore as Technological Assistant.

Another Junior Tester of the Laboratory, Mr. P. D. Vakil, was transferred as Examiner of Stores in the Indian Stores Department with effect from the 5th March 1941 and this vacancy was filled up by the appointment of Mr. T. R. Krishnamurthy.

The post of a Typist-Clerk, which had been created some time back, was filled up during the period under review by the appointment of Mr. M. S. Subbaram with effect from the 15th January 1941. Mr. Subbaram has been deputed for the Testing House work undertaken on behalf of the Indian Stores Department with effect from the 15th April 1941.

Mr. G. G. Oka was appointed to the post of the Ginning Supervisor with effect from the 28th December 1940.

In order to cope with the additional work in the Yarn Testing Section, four temporary Junior Testers were employed. They were Messrs. T. R. Krishnamurthi, S. S. Rangan, M. Ramchandrarao and N. C. Chiplonkar.

In order to cope with the large amount of work in the Testing House, especially in regard to the samples sent by the Indian Stores Department or the mills submitting their tenders to the Government, six posts of temporary Junior Testers were created on behalf of the Indian Stores Department and filled up by the appointment of Messrs. S. S. Rangan, M. Ramchandra Rao, B. A. Nabar, G. G. Wagle, M. S. S. Naidu and R. F. Patil.

For the work on the analysis of coir yarns to which a reference has been made on page 14 two posts of temporary Junior Testers for a period of two months in the first instance were created on behalf of the Agricultural Marketing Adviser to the Government of India and Messrs. P. B. Mehta and P. M. Ghosh were appointed to these posts.

Mr. L. N. Prabhu was selected for training in the elements of cotton technology and yarn testing and he joined the Laboratory with effect from the 6th January 1941.

Exhibition.—During the period under review the Laboratory participated in the Agricultural Exhibition, Gwalior, which was held from the 24th December 1940 to 14th January 1941. A large number of exhibits including halo cards, Baer sorter patterns, card sliver, yarn knots, etc., prepared from Indian cottons were despatched to this Exhibition. These were also supplemented by a number of testing instruments, and Mr. R. Krishna Iyer was deputed to do the demonstration work at this Exhibition. He remained on duty at Gwalior from the 19th December 1940 to 15th January 1941. I am glad to state that a silver medal and a certificate for the Laboratory exhibits and demonstrations were awarded by the exhibition authorities.

The writer was elected President of the Section of Agriculture of the Indian Science Congress for its next session to be held in January 1942 at Dacca.

ACKNOWLEDGMENTS.

My thanks are due to the office-bearers of the Indian Central Cotton Committee for their support and active interest in all matters relating to the Laboratory and to the staff of the Laboratory for their loyal co-operation throughout the year. I am also grateful to Mr. Purshotamdas Harkisondas of Messrs. Bhaidas Cursondas & Co., Bombay, for his valued assistance in grading the large number of samples tested at the Laboratory.

(Sd.) NAZIR AHMAD,
Director,
Technological Laboratory,
Matunga, Bombay.

Dated the 17th June 1941.

APPENDIX II.

LIST OF SCIENTIFIC AND TECHNICAL STAFF OF THE TECHNOLOGICAL LABORATORY AS ON 31ST MAY 1941.

	Designation.	Name.	Remarks.
1.	Director	Dr. Nazir Ahmad, O.B.E., Ph.D., F.Inst., P...	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga.
2.	Senior Research Assistant (Chemist) and Superintendent, Testing House	Mr. D. L. Sen, M.Sc., Tech. (Manch.), M.Sc., (Bom.), A.I.I.Sc., F.I.C.	Research Student of the Indian Institute of Science and Manchester College of Technology.
3.	Senior Research Assistant (Physicist) ..	Mr. N. Hari Rao, M.Sc. (Calcutta)	Research Scholar, Technological Laboratory (Textile Physics).
4.	Senior Research Assistant (Physicist) ..	Mr. R. S. Koshal, M.Sc. (Punjab)	Do. do.
5.	Temporary Chemist	Dr. L. Thoria, (Dr. Ing.)	....
6.	Spinning Master	Mr. V. V. Gupte, B.Sc., Tech. (Manchester) B.Sc. (Bombay).	....
7.	Junior Research Assistant (Microscopist)	Mr. A. N. Gulati, M.Sc. (Punjab)	Imperial Institute of Veterinary Research, Mukteshwar, U.P.
8.	Statistician and Personal Assistant ..	Mr. V. Venkataraman, M.A. (Madras) ..	Statistical Assistant, Labour Office, Government of Bombay.
9.	Junior Research Assistant (Physicist) ..	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory (Textile Physics).
10.	Do. (Physicist) ..	Mr. R. L. N. Iyenger, M.Sc. (Madras) ..	Research Scholar, Technological Laboratory and Technological Assistant, Coimbatore.
11.	Head Tester	Mr. H. B. Joshi, B.Sc.	....
12.	Senior Tester	Mr. S. S. Sukthanker, L.T.C. (V.J.T.I.) ..	....
13.	Junior Tester	Mr. G. D. Bhide, B.Sc...	....

APPENDIX II—*continued.*

LIST OF SCIENTIFIC AND TECHNICAL STAFF OF THE TECHNOLOGICAL LABORATORY AS ON 31ST MAY 1941—*continued.*

	Designation.	Name.	Remarks.
14.	Junior Tester	Mr. K. V. N. Nayar	....
15.	Do.	Mr. V. N. Modak, B.Sc.	....
16.	Do.	Mr. L. V. Sundararaman, B.A.	....
17.	Do.	Mr. P. S. Sambamurthi	....
18.	Do.	Mr. R. G. Panvalkar, B.Sc.	....
19.	Do.	Mr. G. J. Kharkar, B.Sc.	....
20.	Do.	Mr. A. J. Farid	....
21.	Do.	Mr. P. V. Nachane, B.Sc.	....
22.	Do.	Mr. C. S. Ramanathan, B.Sc.	....
23.	Do.	Mr. B. N. Prabhakar, M.Sc.	....
24.	Do.	Mr. S. B. Mogre, M.Sc...	....
25.	Do.	Mr. C. A. S. Iyer, B.Sc.	....
26.	Do.	Mr. M. Bhasker Rao	....
27.	Officiating Junior Tester	Mr. R. B. Joshi, B.Sc.	....
28.	Do. do.	Mr. S. Ramanathan.	....
29.	Do. do.	Mr. N. C. Chiplonkar, B.Sc.	....
30.	Do. do.	Mr. T. R. Krishnamurthy, B.Sc.	....
31.	Temp. do.	Mr. S. S. Rangan, B.Sc.	....
32.	Do. do.	Mr. M. Ramchandra Rao, L.T.M.	....
33.	Do. do.	Mr. B. A. Nabar, B.Sc.	....
34.	Do. do.	Mr. G. G. Wagle, B.Sc.	....
35.	Do. do.	Mr. M. S. S. Naidu	....
36.	Do. do.	Mr. R. F. Patil, I.Sc.	....
37.	Do. do.	Mr. P. B. Mehta, B.Sc.	....
38.	Do. do.	Mr. P. M. Ghosh, B.Sc.	....
39.	Gin Supervisor (Temporary)	Mr. G. G. Oka	....
40.	Statistical Clerk	Mr. R. Krishna Iyer	....
41.	Do.	Mr. P. K. Wagle	....
42.	Electrician	Mr. H. Lobo, L.E.E. (V.J.T.I.)	....
43.	Spinning Assistant	Mr. A.G.N. Iyengar	....
44.	Draughtsman	Mr. B. G. Mehta	....
45.	Mechanic	Mr. J. B. Kharas	....

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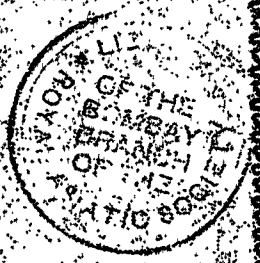


ANNUAL REPORT

OF THE

DIRECTOR

TECHNOLOGICAL LABORATORY

FOR THE

YEAR ENDING 31st MAY 1942

Price, 6 annas

Obtainable from the Secretary, Indian Central Cotton Committee,
Post Box No. 1002, Bombay.

INDIAN CENTRAL COTTON COMMITTEE

ANNUAL REPORT

OF THE

DIRECTOR

TECHNOLOGICAL LABORATORY

FOR THE

YEAR ENDING 31st MAY 1942

Annual Report of the Director, Technological Laboratory, for the Year Ending 31st May 1942.

THE present report contains an account of the work done at the Laboratory between the period 1st June 1941 and 31st May 1942. It will be seen from a perusal of this report that good progress has been made in all the Sections of the Laboratory. Some of the technological investigations have been completed during this period and the number of samples which were received for tests of different types has reached a new record surpassing the last year's figure, which was nearly 2½ times as large as the previous year's figure. Work was continued in the new Ginning Section of the Laboratory, and the first series of experiments on the pre-cleaning of Indian seed-cottons on different machines and on ginning them with different speeds and settings in the saw gins and roller gins, etc., was completed, and a report prepared during the period under review. Further experiments on the ginning problems were also commenced during this period.

The work done during the period under review will now be described under the following eight heads :—

I. Spinning Laboratory.

II. Testing House.

III. Fibre Testing Section.

IV. Technological Research.

V. Ginning Section.

VI. Moisture Testing Section.

VII. Publications.

VIII. General.

I. SPINNING LABORATORY.

The samples of cotton, yarn and cloth received for tests during the period under review have been classified in Table I which also shows the corresponding figures for last year :—

TABLE I.

	1-6-40 to 31-5-41.	1-6-41 to 31-5-42.
Agricultural Departments	446	349
Standard cottons	23	26
Trade tests	74	99
Fibre „	180	221
Yarn „	327	325
Cloth „	697	988
Special „	48	91
Miscellaneous	5	1
Grand Total ..	1,800	2,100

It will be noticed that, with the exception of the samples received from the Agricultural Departments, all the other samples show an increase as compared with last year. This increase is most pronounced in the case of samples received for cloth tests, which were 40 per cent. more than those received last year. The total number of samples received for tests during the period under review was 2,100 as against 1,800 for last year, representing an increase of over 16 per cent. in the last year's very considerable figure. It should, however, be noted, in this connection, that the arrangement by which the Indian Stores Department had agreed to send its development samples and samples against tenders to the Laboratory for tests was terminated on the 1st December 1941, when the Controller General of Inspection established a textile testing laboratory in Bombay. The reports issued from the Technological Laboratory, however, are still regarded as authoritative by the Indian Stores Department, and many mills are sending their samples to be tested on payment of fees; but with the termination of this arrangement we must expect a decrease in the number of samples, especially the yarn and cloth samples, which may be sent to the Laboratory for tests in the future.

The following statement A gives the particulars of the agricultural samples spun during the period under review together with the names of the suppliers of the samples. It should be noted in this connection that this statement gives details of only those samples which were received from the Agricultural Departments, while similar details for standard cottons and trade varieties will be found on pages 12–13.

STATEMENT A.

BOMBAY.

(1) *The Cotton Breeder, Dharwar.*—36 samples of Jayawant, Early Jayawant, New Jayawant, and crosses.

(2) *The Cotton Breeder, Jalgaon.*—19 samples of Jarila, Banilla, N.R. 6 cottons.

(3) *The Cotton Breeder, Surat.*—6 samples of 1027 A.L.F., 1A Long Boll and Segregates.

(4) *The Cotton Breeder, Broach.*—17 samples of B.D. 8, Segregates and other strains.

(5) *The Cotton Breeder, Viramgam.*—22 samples of Wagads, Segregates and other strains.

(6) *The Senior Botanical Assistant, Gadag.*—2 samples of Gadag and Co. 2 crosses.

SIND.

(1) *The Botanist, Agricultural Research Station, Dokri.*—4 samples of Sind Sudhar, 4F-98, M. 4 and Hybrid 101.

(2) *The Cotton Botanist, Mirpurkhas.*—3 samples of Sind Sudhar, M. 4 and Sea Island cottons.

(3) *The Botanist, Agricultural Research Station, Sakrand.*—One sample of Sind Sudhar.

PUNJAB.

(1) *The Cotton Research Botanist, Lyallpur.*—27 samples of different selections.

UNITED PROVINCES.

(1) *The Economic Botanist, U. P., Cawnpore.*—48 samples of C. 402, C. 520, D,A,L., Perso-American, Local and other cottons.

(2) *The Senior Botanical Assistant, Raya.*—25 samples of C. 520, Perso-American, Local and other strains.

(3) *The Farm Superintendent, Hardoi.*—7 samples of C. 520, C. 402, D,A, Local and other cottons.

MADRAS.

(1) *The Cotton Specialist, Coimbatore.*—13 samples of Co. 2, Co. 3, Co. 4 and other cottons.

(2) *The Farm Manager, Koilpatti.*—2 samples of K. 1 and 4706.

(3) *The Superintendent, Dry Farming Station, Bellary.*—8 samples of H. 1 and A. 265 cottons.

(4) *The Gazetted Assistant, Mungari Scheme, Adoni.*—5 samples of X 4383B, V. 434, P. 710, 6042 and local cottons.

(5) *The Cotton Assistant, Nandyal.*—6 samples of Selections.

CENTRAL PROVINCES.

(1) *The Cotton Research Officer, Berar Cotton Breeding Scheme, Akola, Berar.*—7 samples of Buri 103, H. 415, H. 420 and other strains.

(2) *The Economic Botanist, C.P., Nagpur.*—2 samples of Buri 107 and H. 420.

(3) *The Superintendent, Government Agricultural Farm, Akola.*—1 sample of Buri 107 cotton.

INDORE.

(1) *The Geneticist and Botanist, Institute of Plant Industry, Indore.*—9 samples of M. 9, M. U. 4, Indore I, Buri 107, X4463 and mixtures.

(2) *The Director, Institute of Plant Industry, Indore.*—32 samples of Indore, Dhar and Badnawar cottons.

HYDERABAD.

(1) *The Cotton Research Botanist, Parbhani.*—20 samples of Gaorani and other selections.

(2) *The Superintendent, Govt. Main Farm, Raichur.*—5 samples of Kumpta strains, Hagari and Local.

BARODA.

(1) *The Economic Botanist, Baroda.*—3 samples of Karkhadi and Broach cottons.

(2) *The Assistant Cotton Breeder, Jagudan.*—11 samples of Wagad, Segregate and other strains.

(3) *The Superintendent, Government Farm, Dabhoi.*—8 samples of B.D. 8 and Segregate cottons.

(4) *The Superintendent, Cotton Farm, Vesma.*—5 samples of 1027 A.L.F. strains and Segregate 8-1.

(5) *The Assistant Cotton Breeder, Amreli.*—12 samples of Selections.

BIKANER.

(1) *The Agricultural Officer, Sri Ganganagar, Bikaner State.*—11 samples of strains and types.

MYSORE.

(1) *The Economic Botanist, Bangalore.*—11 samples of Co. 4, M.A. 1, Co. 2, other crosses and Giza cottons.

(2) *The Manager, Babbur Farm, Hiriyur.*—4 samples of Selection 69, H. 190 and other cottons.

FOREIGN.

(1) *The Botanist, Buganda Expt. Station, Uganda.*—8 samples of cottons.

The following Tables II and III give the distribution of the samples and yarns spun at the Laboratory during the period under review together with the corresponding figures for the previous years since 1924-25 :—

TABLE II.—*Distribution of Samples spun, 1924-42.*

Province.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.	1939-40.	1940-41.	1941-42.
Bombay	18	26	22	22	28	66	89	69	143	111	97	59	67	44	78	42	69	102
Sind	..	..	..	..	..	..	..	..	..	..	..	28	47	..	21	8	10	8
Punjab	14	1	..	..	42	30	10	44	55	42	23	71	9	45	57	61	50	27
U. P.	7	..	6	11	9	7	16	7	12	6	7	11	..	2	36	66	14	80
Madras	2	19	50	23	30	51	66	15	28	101	30	51	31	31	42	30	33	34
C. P.	2	..	3	2	2	5	3	3	5	9	9	10	15	9	9	5	7	10
Miscellaneous ..	3	11	..	6	6	27	28	33	75	97	85	100	85	97	104	97	150	139
Total ..	46	57	81	64	117	186	212	171	318	366	251	330	254	228	347	300	333	400
Standard Cottons Trade and Special Tests	8	54	49	64	33	34	27	18	18	16	18	23	15	21	21	19	21	22
	..	..	..	..	..	37	89	134	125	166	131	143	162	185	172	122	169	177
Grand Total ..	54	111	130	128	150	257	328	323	461	548	400	496	431	434	540	450	523	599

TABLE III.—*Distribution of Yarns spun, 1924-42.*

Province.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.	1939-40.	1940-41.	1941-42.
Bombay	103	152	132	132	159	322	253	203	430	332	292	190	217	134	249	127	195	325
Sind	..	..	..	..	..	..	..	..	..	..	..	84	143	..	68	26	32	24
Punjab	106	14	..	..	254	113	31	136	165	127	72	220	28	144	168	195	149	54
U. P.	27	..	36	66	54	42	40	22	32	18	21	35	..	6	94	197	43	249
Madras	12	108	278	138	180	255	199	53	85	303	90	151	89	91	123	92	93	86
C. P.	8	..	18	12	12	30	12	9	15	27	29	30	45	28	26	15	21	29
Miscellaneous ..	3	58	..	36	27	99	100	93	227	293	250	295	261	292	299	281	433	359
Total ..	259	332	464	384	686	861	635	516	954	1,100	754	1,005	783	695	1,027	933	966	1,126
Standard Cottons Trade and Special Tests	95	514	423	447	290	223	309	136	200	180	204	162	115	156	152	144	152	162
	..	..	..	..	..	80	343	502	256	499	810	609	649	665	498	423	410	560
Grand Total ..	354	846	887	831	976	1,164	1,287	1,154	1,410	1,779	1,768	1,776	1,547	1,516	1,677	1,500	1,528	1,848

It will be seen that the total number of samples spun was 599 as against 523 in the last year, representing an increase of nearly 15 per cent. This is the highest number of samples spun in a year in the Laboratory since its inception, the previous record figure of 548 being obtained in 1933-34. This also probably represents the limit of the number of samples which can be spun in a year following the present technique and with the existing machinery. The total number of yarns spun during the period under review was 1848 as against 1528 in the last year, representing an increase of nearly 21 per cent. This figure also represents the highest number of yarns spun in the course of a year in the Laboratory since its inception, the previous record figure of 1779 having been obtained in 1933-34. It will be noticed that individually the largest number of samples tested were those received from the Bombay Province, while the samples from the United Provinces took the next place. The total number of samples tested on behalf of the Agricultural Departments was 400 as against 333 in the last year. In spite of this increase in the number of agricultural samples, the number of samples for the trade tests and special tests was not allowed to decrease, but actually shows a small increase over the last year's figure.

The following table IV gives the summary of the test reports of various kinds issued during the period under review together with the corresponding figures for each year since 1924-25 :—

TABLE IV.—*Test Reports Issued, 1924-42.*

Reports	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.	1939-40.	1940-41.	1941-42.
Spinning Test	7	19	19	22	21	63	92	60	87	121	112	135	129	109	127	114	135	144
Fibre Test	1	1	5	1	7	4	7	19	30	18	19	44	52	32	35	42	52	59
Yarn Test	..	..	..	1	4	4	2	3	5	3	7	13	10	14	20	36	234	180
Cloth Test	..	..	..	..	..	..	..	..	..	..	..	..	..	..	25	69	624	821
Statistical Analysis ..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	3	..	..	2
Miscellaneous	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	2
Total Reports ..	8	20	24	24	32	71	101	82	122	142	138	192	191	158	211	261	1046	1208

It will be noticed that with the exception of the yarn test reports, all the other reports show an increase in number as compared with last year. The total number of reports issued during the period under review was 1208 as against 1046 issued during last year, representing an increase of over 15 per cent. The total number of reports issued during this period is equivalent to over 100 reports per month, which was practically the number of reports issued during the whole year in 1930-31 or 1931-32.

The following table V gives the strength of the permanent staff employed at the Laboratory during the period under review together with the corresponding figures for the previous years since 1924.

TABLE V.—*Permanent Staff, 1924-42.*

	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Technical and Office staff	8	11	20	24	27	27	32	32	32	33	34	34	35	36	36	36	38	39	39
Research Students ..	1	3	6	4	3	2	1	1	..	..	..	..	2	2	2	1	..	..	..
Fumigation Chemists ..	..	..	2	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total ..	9	14	28	32	32	31	35	35	34	35	36	36	39	40	40	39	40	41	41

It will be seen that the strength of the permanent staff remained unchanged during this period. However, in order to cope with the large amount of testing work in connection with the samples received by virtue of the arrangement with the Indian Stores Department, a number of temporary Junior Testers were employed for a part of this period. Details of these Junior Testers will be found on page 42.

The samples tested at the Laboratory were mostly of a routine nature, but the following among them deserve special mention.

A. AGRICULTURAL SAMPLES.

(1) *Mill tests on Surat cottons.*—At the request of the Cotton Breeder, South Gujerat, Surat, arrangements were made for carrying out mill tests on bales of 1027 A.L.F., 1A Long Boll and Segregate 8-1 in one of the local mills, while spinning tests were also made at the Laboratory on samples of these cottons taken from the bales supplied to the mills. It was found that the three cottons gave nearly equal performance in each of the two places, *i.e.*, the mill and the Laboratory, but that the mill obtained somewhat higher performance than that obtained at the Laboratory. In the mill tests, 1A Long Boll gave slightly stronger yarns than the other two cottons, while in the Laboratory tests 1027 A.L.F. and Segregate 8-1 gave slightly better performance than 1A Long Boll.

(2) *Mill tests on Broach cottons.*—Arrangements were also made for carrying out mill tests on bales of another four cottons, B.D. 8, Segregate 1-2, Segregate 1-6 and Broach Local supplied by the Cotton Breeder, Broach, while spinning tests were also made at the Laboratory on small samples taken from these bales. According to both tests at both places, Segregates 1-2 and 1-6 gave definitely superior performance than Broach Local. However, while in the mill tests B.D. 8 yielded stronger yarns than the two Segregates, in the Laboratory tests the performance of B.D. 8 was found to be inferior to that of the Segregates. In view of the fact that the difference between the mill test and the Laboratory test was fairly large in this particular case, it was suggested that these tests should be repeated in the following season. Accordingly, arrangements have been made for carrying out mill and Laboratory tests on these cottons in the current season.

(3) *Variety trials of U.P. cottons.*—Samples of seven varieties of cottons namely, C. 520, C. 402, Perso-American, Sample D, Sample A, Sample L and Desi grown in five different localities in the United Provinces, *i.e.*, Cawnpore, Nagina, Kalai, Raya and Belatal were received for tests. The results of the tests carried out at the Laboratory on these samples were analysed statistically. It was found that Perso-American gave the best performance, C. 402 came next, Sample A took the third place, while C. 520, Samples D and L, which did not differ significantly from one another, occupied the last place. It was further found that all these six cottons gave significantly better performance than the Desi cotton. Furthermore, it was found that the samples grown at Cawnpore, Nagina and Kalai gave, on the whole, better spinning performance than those raised at Raya and Belatal. A detailed report embodying these results was issued to the Economic Botanist to Government, United Provinces, Cawnpore. It may be mentioned in this connection that similar samples have again been received for tests in the current year.

(4) *Different pickings of Perso-American and C.* 520.—The question of the fibre properties and spinning performance of different pickings of Indian cottons was considered by the Committee, and it was decided that spinning tests should be made on samples of different pickings in order to ascertain, in a quantitative way, the variations in the quality of cotton with different pickings. Accordingly, samples of different pickings of Umri Bani, Gaorani 6, Havre, 3, P.A. 4F, P.A. 289F/43, Sind Sudhar (roller-ginned), Sind Sudhar (saw-ginned), Sind 4F-98 and Sind N.R. cottons were requisitioned and tested, and a separate report has been prepared for consideration by the Committee. In addition to this work, samples representing six pickings each of C. 520 and Perso-American grown at Raya were also received for tests. As these tests gave some interesting results, they are briefly mentioned here. C. 520 was picked weekly except the last picking which was collected after two weeks' interval. It was found that the last two pickings were definitely shorter but finer in staple than the earlier pickings and that they sustained higher waste losses both in the blow-room and the card. The first and second pickings yielded the strongest yarns after which the yarn strength fell steadily, the fall being quite pronounced for the last two pickings. In the case of Perso-American the pickings were made at irregular intervals. Here again the second picking gave the highest mean length, while the last two pickings were somewhat shorter but finer in staple than the other pickings. The waste losses for the last picking were also about 3 per cent. higher than for the others. The second picking gave slightly stronger yarns than the first picking, the yarns spun from the third, fourth and fifth pickings possessed nearly the same strength, which was somewhat lower than that of the second picking, while the yarns obtained from the last picking were definitely weaker than those spun from the other pickings. Thus, in this case also the last picking gave the poorest performance, while the decline in yarn strength was not so progressive as in the case of C. 520.

(5) *Dharwar cottons.*—Three cottons, namely, Jayawant, New Jayawant and Early Jayawant, have been evolved for the Dharwar tract. In order to

ascertain which of these cottons is best suited for this tract they were grown at seven different centres, namely, Dharwar, Hubli, Haveri, Athani, Bagalkote, Bailhongal and Bijapur. The tests on these 21 samples were made during the period under review, and the results were statistically analysed. The analysis showed that Jayawant and New Jayawant gave significantly better performance than Early Jayawant, if all the localities are taken into consideration. In Bailhongal, however, New Jayawant gave practically the same test as Early Jayawant. These tests also showed that, taking the three cottons into consideration, Dharwar and Hubli produced the best samples, Athani came next, Bagalkote, Bailhongal and Bijapur took the third place, while the samples grown at Haveri gave the poorest performance.

Such comparative tests carried on a number of strains grown at different centres in a cotton growing tract are capable of giving very useful information. They enlighten us, on the one hand, as to the order in which the new strains may be placed taking all the localities into account, and on the other, they yield valuable information as to the particular locality or localities which are best suited for each strain. It is, therefore, desirable that such experiments should be laid out carefully according to a well-designed plan with sufficient replications for each variety so that full information may be obtained from the tests carried out on the samples.

(6) *Co. 4 Cotton.*—This is a new cross between Co. 2 and Uganda U. 4/4, which has been developed at Coimbatore. During the period under review samples of this cotton grown in the Irwin Canal Area in Mysore State and South Arcot District (Madras Presidency) were received for tests at the Laboratory. The Mysore sample was found to possess a mean fibre-length of 1.00″, while the other sample was slightly shorter in staple. Both samples were found suitable for spinning upto 34s standard warp counts which is better than the performance of standard Cambodia Co. 2, but is not equal to that of Co. 4 grown in Coimbatore.

(7) *Long Staple cottons grown in Mysore State.*—As a part of the efforts to grow long staple cottons in India, two samples, namely, Giza 7 and Giza 12, raised in the Irwin Canal Area in Mysore State were received for tests. These were grown on heavily manured plots from seed imported from Egypt. The results of the tests showed that Mysore Giza 7 possessed a mean length of 1.19″ and was found suitable for spinning upto 70s standard warp counts, while Mysore Giza 12, which had a mean length of 1.16″, was found suitable for spinning upto 60s standard warp counts. This is the first year of trial of these long staple cottons in Mysore.

(8) *Crosses of Co. 2 with Uganda and 289F/38.*—Four samples of crosses between Co. 2 and Uganda and Co. 2 and 289F/38 which were grown in the Irwin Canal Area in Mysore State on heavily manured plots were also received for tests. The results of tests showed that while Uganda × Co. 2 was definitely superior to Co. 2 × Uganda, no such difference was observed between the two crosses of Co. 2 and 289F/38.

(9) *Co. 2 X-rayed.*—Another interesting sample received from the same place was a sample of Co. 2 cotton grown from seed which had been irradiated with X-rays. It was found to be 9 per cent. longer in staple than the standard Cambodia Co. 2 cotton and gave a definitely better spinning performance. It would certainly be interesting to repeat this experiment in the following seasons with Co. 2 and other cottons in order to see whether this improvement both in staple length and spinning performance is exhibited by them.

(10) *Jarila cotton.*—As is well known this cotton has now spread over a large part of Khandesh. Samples grown at different centres, namely Jalgaon, Dhulia, Waghali, Panchak, Mohadi, Salsingi and Bhadgaon, in the two seasons 1940-42 season had been received for tests at the Laboratory. These tests showed that on the average, the samples grown at Jalgaon gave the best performance, those raised at Dhulia and Mohadi came next, those grown at Panchak and Salsingi took the third place, while the samples raised at Bhadgaon and Waghali yielded the weakest yarns.

Furthermore, two samples of this cotton grown in Khakurdi in the Nasik District were also received for tests. One of these samples had received irrigation prior to sowing, while the other was dry sown. It was found that the sample which had received irrigation prior to sowing, was slightly finer in staple, less wasty and yielded more even and stronger yarns than the sample raised without any irrigation. It should, however, be mentioned in this connection that both the samples from the Nasik District were inferior to those grown in Khandesh.

(11) *Viramgam cottons.*—Samples of three Viramgam cottons, namely, Wagad 8, Segregate 4-1 and Wagad Local were raised under five different conditions, namely, Sanand Dry, Patdi Irrigated, Dholka Irrigated, Tagadi Early, and Tagadi Late. The results of the tests carried out on these samples showed that Segregate 4-1 gave better spinning performance than the other two cottons under all the five different conditions, the difference being more accentuated by irrigated crop. They further showed that the samples grown late gave better spinning performance than those raised early at Tagadi.

(12) *Mixed cultivation at Indore.*—The question of mixed cultivation of different varieties of cotton was discussed at some length at the Second Conference of Scientific Research Workers on Cotton in India. In order to gain some information on this question, samples of mixtures of M. U. 4, Indore I, Buri 107 and X4463 grown in mixed cultivation with M. 9 were raised at Indore. These samples, together with samples of the pure cottons, were received for tests at the Laboratory. The mixtures consisted of equal proportions of the components based on seed-weight. The results of the tests carried out at the Laboratory showed that the performance of the mixtures of M. 9 with M. U. 4 and Indore 1 lay very near to what might be expected from the individual performance of their components. On the other hand, the performance of the mixture of M. 9 with X4463 was better, while that of the mixture of M. 9 with Buri 107 was definitely lower than what might be expected from the results of the tests carried out on the pure cottons. Thus, these tests show that M. 9 might give better results when grown in mixed

cultivation with X4463 than with Buri 107. These are very interesting results, and the experiments deserve to be followed up in the subsequent seasons.

(13) *Uganda cottons.*—As in the past, fibre and spinning tests were carried out during the period under review on eight samples of Uganda cottons supplied by the Botanist, Buganda Experimental Station, Uganda. Of these, 4 samples belonged to the N. 17 type, while the other 4 samples were named B. 181, B. P. 52, X. 3.38 and Local. It is interesting to note that in spite of fairly large differences in their fibre-properties, the spinning performance of these cottons varied within a narrow range.

(14) *Bikaner State cottons.*—Eleven samples, including those of C. 520, Sanguineum and some *desi* types, were received from Bikaner. The results of the tests made on them showed that a cotton called " Type II " gave a spinning performance of 15½s standard warp counts, which is even superior to that of C. 520. However, all the other samples were either nearly equal or even inferior in performance to C. 520.

(15) *Hagari 1 raised at different centres.*—Samples of Hagari I raised at five different centres, namely, Hagari, Bellary, Adoni, Guntakal, and Tadpatri have been received for tests for six consecutive seasons. As sufficient data was available, the results of these tests have been statistically analysed. It is found that both fibre-length and highest standard warp counts show significant variation for locality as well as for season, while fibre-weight per inch does not show any such variation. It is further found that the sample from Tadpatri (medium black soil) gave significantly lower mean fibre-length than any of the other samples, which did not differ significantly from one another in this respect. However, the samples from Adoni and Hagari gave significantly better spinning performance than the samples from the other three centres, among which the sample from Tadpatri (medium black soil) gave the lowest results. Furthermore, this cotton grown in heavy black soil is capable of giving better test than when grown in medium black soil irrespective of the seasonal variation.

B. Standard Cottons.

As in the past, detailed tests were carried out on samples of standard Indian cottons and a Technological Bulletin containing the results of these tests on samples of the 1940-41 season was published during the period under review. Prior to the publication of this bulletin, technological circulars were issued on those cottons which had been received fairly early in the season.

The following statement gives the names of the standard cottons belonging to the 1941-42 season which have so far been received at the Laboratory :—

Bombay.

1. Jayawant.
2. Gadag 1 (Dharwar-American).

3. Surat 1027 A.L.F.
4. Wagad 8.
5. Jarila.

SIND.

1. Sind Sudhar (roller-ginned).
2. Sind Sudhar (saw-ginned).
3. Sind N. R. (W. N. 27).

PUNJAB.

1. P. A. 4F.
2. L. S. S.
3. 289F/K. 25.
4. Mollisoni.

CENTRAL PROVINCES.

1. V. 434 (Akola).
2. Late Verum (Nagpur).

HYDERABAD.

1. Umri Bani.
2. Gaorani 6.

MADRAS.

1. Co. 2.
2. N. 14.
3. Hagari 1.

Of these, tests have already been completed on Jarila, Umri Bani, Late Verum (Nagpur) and V. 434 (Akola) on which 4-page technological circulars have been issued. The fibre and spinning tests on the remaining cottons are in progress.

In this connection it may be mentioned that Verum 262 (Nagpur), Verum 262 (Akola) and P. A. 289F, which have so far figured among the list of standard Indian cottons, have now been deleted from this list by the Committee, the two former cottons having been almost completely replaced by V. 434, while the latter cotton has been replaced by the improved varieties, 289F/43, 289F/K. 25, etc.

C. TRADE VARIETIES.

The Indian Central Cotton Committee has entered into an agreement with the East India Cotton Association, Ltd., Bombay, by which samples

of fair average quality of certain trade varieties are received and tested at the Laboratory. The results of these tests are published for general information in 2-3 page technological circulars, and are later on compiled in the form of a Technological Bulletin entitled "Technological Reports on Trade Varieties of Indian Cottons." The Committee has also entered into an arrangement with the Millowners' Associations of Bombay, Ahmedabad and Southern India by which samples of early arrivals of certain trade varieties are received and tested at the Laboratory, and the results are also broadcast in 2-3 page technological circulars. During the period under review, the following samples of trade varieties belonging to the 1941-42 season were received in the Laboratory.—

1. *Samples supplied by the East India Cotton Association.*—

1. C. P. No. 1.
2. Berar.
3. Khandesh.
4. Sind Sudhar.
5. P. A. 4F.
6. P. A. 289F/43.
7. P. A. L. S. S.
8. Broach.
9. Jayawant.
10. Upland (Gadag).
11. Farm Westerns.
12. Navsari.
13. Verum.

2. *Samples supplied through the Bombay Millowners' Association.*—

1. Farm Westerns.
2. Broach.
3. Westerns.
4. Hubli Jayawant.
5. Bailhongal.
6. Miraj.

3. *Samples supplied through the Ahmedabad Millowners' Association.*—

1. Jagadia.
2. Surat.
3. Kadi.

A list of the technological circulars issued on these samples on which tests were completed during the period under review will be found under the head 'Publications'.

It may be mentioned in this connection that 289F has been deleted from this list by the Indian Central Cotton Committee, while Hubli Kumpta has been replaced by Hubli Jayawant. Furthermore, in view of the fact that samples of V. 434 and Gaorani 6, which are included in the list, were not available in the local market, arrangements were made to obtain them from the Directors of Agriculture of Central Provinces and Hyderabad, Deccan, respectively. These samples, however, were first sent to the Standards Committee of the East India Cotton Association for valuation and approval as representing the fair average quality of each type.

II. TESTING HOUSE.

The number of samples of different kinds received in this Section of the Laboratory during the period under review are given in the following table which also shows the corresponding figures for the previous years since 1936-37 :—

TABLE VI.

Tests.	1-6-36 to 31-5-37	1-6-37 to 31-5-38	1-6-38 to 31-5-39	1-6-39 to 31-5-40	1-6-40 to 31-5-41	1-6-41 to 31-5-42
Spinning tests	6	12	11	20	45	62
Fibre tests	24	26	36	67	51	68
Yarn tests	23	37	49	80	323	325
Cloth tests	..	23	39	117	696	988
Moisture tests	41	20	8	19	4	..
Shirley Analyser tests	1	..	..	1	..	..
Blow-room test	1	..	..	..	..	..
Dye absorption test	..	..	2	..	..	1
Miscellaneous test	..	..	..	..	1	1
Total ..	96	118	145	304	1,120	1,445

It will be seen that samples under each head show an increase as compared with last year, this increase being most pronounced in the case of samples received for cloth texts. This was largely due to the arrangement with the Indian Stores Department by which the development samples and samples submitted against tenders from the cotton mills in the Bombay Province were sent to the Testing House of the Laboratory for tests. Since this arrangement has now been terminated, we must expect a decrease in the number of these samples, though it may be mentioned that quite a number of mills continue to send their samples to the Laboratory for tests on payment of fees. It should also be stated here that the reports issued from the Laboratory are recognised as authoritative by the Government Departments and therefore the mills and firms are welcome to take advantage of the facilities offered by the Laboratory by sending their samples for tests. The total number of samples received in the Testing House during the period under review was 1,445 as against 1,120 for last year, showing an increase of over 29 per cent.

The samples received in the Testing House covered a wide range of numerous types of textile materials required for the use of the Army, the Navy,

the Air Force and the War Hospitals, and the tests carried out on these samples also covered a very wide range for which the Testing House has now got the complete equipment. In addition to the ordinary tests such as determination of counts, turns per inch, tensile strength, shrinkage, scouring loss, percentage of sizing materials, etc., apparatus have been set up and tests were carried out on the determination of whiteness, fastness of dyes to light, perspiration and washing, hydrogen ion concentration, presence of oxycellulose, etc. Most of these tests were of a routine character, but several of them represented technical difficulties confronted by the mills and firms in their manufacturing processes, and their solution formed small *ad hoc* investigations of special interest. These will now be briefly described.

(1) A sample of insulating tape was tested on behalf of Government Department in order to find out its physical properties, manufacturing details and the nature of materials used in its manufacture. A detailed report was issued.

(2) A local mill sent one sample of shirting and another sample of dhoti cloth which gave sub-normal strength, to find out the causes responsible for tendering. It was found that in the shirting cloth the weft yarns and the white warp yarns were tendered due to mechanical and fungal damage. On the other hand, in the dhoti cloth the tendering was found to be due to over-oxidation in the bleaching process, while the holes observed in it were found to be due to the action of acid particles. A detailed report was issued to the mill suggesting the measures for preventing these defects in the future.

(3) A local mill sent one sample of scoured dhoti cloth and another sample of bleached dhoti cloth which had shown signs of tendering to find out the causes responsible for it. It was found that both the samples were attacked by acid. Tendering in the scoured dhoti cloth was traced to the use of defective sizing and/or finishing material, while the tendering in the bleached dhoti was found to be due to over-oxidation in the bleaching treatment.

(4) A local firm sent a sample of red twill cloth which had shown signs of tendering to find out the causes responsible. The tests carried out at the Laboratory showed that the tendering in this case was due to attack by acid in the defective developing solution in dyeing the material.

(5) In another sample sent by a local mill to find out the causes of tendering, it was noticed that only the warp yarns were tendered, while the weft yarns retained their normal strength. This defect was attributed to the probable presence of some metallic oxides in the sizing material, which in the presence of alkali in the kier boil treatment, might have degraded the cellulose.

(6) An up-country mill sent one sample of buff dosuti and another sample of blue dosuti, and wanted to know the method for changing the buff colour to blue colour to match their sample. A practical method was successfully worked out, and a report embodying the results was issued to the mill.

(7) A firm sent three cheeses of cotton cord which contained coloured spots and wanted to know the causes responsible for them. The microscopical examination of these samples showed that the spots were due entirely to the attack of mildew forming fungi, which was brought about by storing the cheeses for a long time in a damp place. A report embodying these findings was issued to the firm.

(8) A mill sent a sample of Long Cloth which was disfigured by stains, and wanted to know a method for removing these stains. It was found that the stains on this cloth were due to the mineral oil which had probably come from the paper tarpaulin used in packing the material, especially under pressure of iron hoops. An inexpensive method for removing the stains was worked out, and a report was issued to the mill.

Most of the tests described above were carried out by Mr. D. L. Sen.

On referring to table VI it will be noticed that the number of samples received at the Laboratory for spinning tests on payment of fees has risen progressively from year to year. During the period under review such tests were made on no less than 62 samples received from outside. This in itself is a proof of the growing confidence in the work of the Laboratory, and the assistance it is able to render to mills and firms, but it is especially gratifying to note in this connection that a number of samples were received from outside India showing that institutions abroad are now soliciting the assistance of the Laboratory in the matter of determining the quality of their cottons. Eighteen samples were received for fibre and spinning tests, on payment of fees, from the Director of Agriculture, Dar-es-Salaam. On receipt of the report on his samples, he has written as follows: "I am very much indebted to you for the very complete reports upon my cottons. The results of spinning tests and the summaries will be most useful." Many of these samples were received for routine tests, but some of them were of special interest as they formed the material for investigations undertaken by the Laboratory on behalf of the agencies supplying the samples. These will now be briefly described:

(1) Two samples of cotton were sent by a firm in order to find out the effect of giving a comparatively mild blow-room treatment and the normal blow-room treatment on their waste percentages and spinning performance and also in order to ascertain the effect of employing different twist multipliers on the strength and other properties of the yarns spun from them. These tests were carried out at the Laboratory and a detailed report was issued to the mill.

(2) *Neppiness in dyed Giza cotton.*—A sample of Giza 7 in its natural state and three samples of the same cotton dyed in three different colours violet, brown and slate, together with roving bobbins and bobbins of grandrelle yarns spun from them were received for examination and tests. It was reported that the yarns spun from a mixture of the grey and the dyed cottons were fluffy and contained a fairly large number of neps. The mill wanted the Laboratory in the first place to find out the causes of neppiness in the yarns,

and in the second place to suggest suitable methods by which this defect could be avoided in future. A series of experiments were undertaken, and it was found that the neppiness was due mostly to the treatment given to the samples in the blow-room and in the subsequent processes. Practical treatments were worked in the Laboratory which gave yarns possessing much fewer neps than those obtained by the mill, and these treatments were communicated to the mill in a detailed report issued from the Laboratory.

(3) A local mill sent samples of three types of Egyptian cotton and wanted to know which of these would give the best mercerising effect after being mercerised in the grey condition as well as the physical or other factors responsible for the differential response, if any, in the mercerising effect. These samples were spun in the Laboratory and mercerised in the grey condition in the mill. A thorough examination was made of the fibre-properties and yarn characters of these samples including the determination of wax content, percentage of mercerisation and gloss percentage. It was found that the degree of mercerisation is a complex phenomenon influenced both by the wax content and fibre-weight per inch of the cotton, while its gloss percentage was found to be associated with its staple length. A detailed report embodying these results was issued to the mill.

III. FIBRE TESTING SECTION.

This Section was fully occupied during the period under review with carrying out fibre tests on the samples received for spinning and other tests at the Laboratory. Details of large size samples on which fibre tests were performed in addition to spinning tests have been given on pages 2 to 6. In addition to these, 207 small size samples were also tested for fibre tests only and the following Statement B gives the details of these samples together with the names of their suppliers :—

STATEMENT B.

1. *The Controller of Inspection, Indian Stores Department, Bombay.*—22 samples of wool cotton and other cottons.
2. *A firm in Bombay.*—5 samples of foreign cotton.
3. *The Assistant Cotton Breeder, Amreli.*—19 samples of cotton.
4. *A mill in Lucknow.*—2 samples of cotton.
5. *A firm in Bombay.*—2 samples of cotton.
6. *The East India Cotton Association, Ltd., Bombay.*—1 sample of cotton.
7. *The Cotton Research Officer, Rangamati.*—8 samples of cotton.
8. *The Cotton Research Botanist, Parbhani.*—5 samples of Gaorani Selections and other cottons.
9. *The Economic Botanist, Jorhat, Assam.*—28 samples of cotton.

10. *The Cotton Breeder, Khandesh, Jalgaon.*—12 samples of Dokras Selections and other crosses.

11. *The District Agricultural Officer, Poona.*—3 samples of cotton.

12. *A mill in Bombay.*—5 samples of Egyptian cotton.

13. *A firm.*—1 sample of Sind N. T. cotton.

14. *The Director, Institute of Plant Industry, Indore.*—23 samples.

15. *A firm in Khamgaon.*—1 sample of cotton.

16. *Agricultural Commissioner for India, New Delhi.*—1 sample of cotton.

17. *A firm in Bombay.*—1 sample of Kapok bag.

18. *A firm in Bombay.*—4 samples of cottons.

19. *The Export Trade Controller, Bombay.*—1 sample of foreign cotton.

20. *The Economic Botanist, Baroda State, Baroda.*—45 samples of Karkhadi progenies.

21. *The Cotton Overseer, Bagalkote.*—18 samples of Hagari and Jayawant cottons.

The total number of samples tested in this Section during the period under review was 856. Most of the samples received only for fibre tests were of a routine character, but the following among them are worthy of special mention :—

(1) *Assam cottons.*—A large number of strains is being tried at Jorhat, Assam. These strains fell into two broad classes, one class comprising very short and coarse types, known as Garo Hill, Kohima, Mokokchong and Borkapas. These include some of the coarsest cottons ever tested in the Laboratory, their fibre-weight per inch running upto 0.450×10^{-6} ozs., while their mean fibre-length ranged from 0.62″ to 0.72″. Another noteworthy feature about these cottons is their very high ginning percentage which in several cases lay in the neighbourhood of 50 per cent. The other class comprised comparatively long and fine cottons such as Bani, Dharwar 1, Cambodia, Mysore-American, etc., which are also being tried in Assam. It was observed that Bani 84 grown in Assam gave a mean length of 1.11″ while the mean fibre-length of the other superior types ranged from 0.92″ to 0.98″. Their fibre-weights per inch were also fairly low, but as it is the first year of their trial, it is premature to draw any conclusions. In addition to these cottons, Punjab-American 289F/43, 289F/K. 25, 289F/124, American-Upland, Perso-American and Sind Sudhar have also been tried in Assam. American-Upland gave a mean fibre-length of 1.06″, while the mean fibre-length of Sind Sudhar was found to be 1.00″. It was, however, noticed that, with the exception of American-Upland and Sind Sudhar, these cottons are rather coarse as compared to their parent varieties.

(2) *Mathio selections.*—During the period under review 14 samples belonging to promising strains of Mathio cotton were examined for their fibre-properties and waste losses (in the Shirley Analyser). On the basis of these results, it was concluded that Strain M. 24, M. 19, F. 5, M. 21, M. 22 and F. 6 gave the best results in the given order. Furthermore, for the 1941-42 season nine selections, isolated from the local cottons, were received for tests, and among them S. 20 and S. 6 were found to possess promising fibre-properties as compared with C. 520, which was treated as the control.

(3) *Dokras cotton.*—Eight samples representing strains of Dokras cotton were received from Jalgaon. These had shown superiority over Jarila in their ginning percentage and were either equal or superior to the latter cotton in yield per acre. They had also been found to be highly wilt resistant. Tests carried out at the Laboratory on these samples showed that Dokras 4-2-5 and 9-2-8-3 are 9 per cent. longer in staple than Jarila, Dokras 4-2-3 was 6% longer in staple, while four other strains had very nearly the same length as Jarila cotton. Furthermore, all these strains were found to be either finer in staple than Jarila or at least equal to it in this respect. Thus, the fibre test results on these strains indicate the need for continuing their examination in the subsequent seasons.

(4) *Cottons from Chittagong Hill Tracts.*—Five samples of these cottons raised on the hill slopes at Sapchari Jhoom in the Chittagong Hill Tracts of Bengal were received for tests. These cottons were sown in May and harvested in November, and received over 120″ of rainfall. They possess high ginning percentage, which generally lies in the neighbourhood of 45%. Among them Strain No. 4A was found to possess 6 per cent. higher mean fibre-length than Garo Hill cotton, while all these strains were finer in staple than the latter cotton.

(5) *Karkhadi progenies.*—No less than 45 samples of these progenies, which are said to be highly resistant to root rot disease, were received for tests during the period under review. These were compared for their fibre properties with Broach 9, which was regarded as the control. It was found that only 5 progenies among them possessed longer staple than the control, while 6 progenies were equal to Broach 9 in this respect. Furthermore, it was found that none of these 45 progenies was finer in staple than Broach 9, while only three strains were equal to the control in this respect. It would thus appear that there is need for further selection with a view to evolving progenies, which while retaining the high resistance to root rot disease, should be superior or at least equal to Broach 9 in respect of fibre properties and spinning performance.

(6) *Comparative tests on Jayawant and Hagari.*—In Bagalkote, Hagari Farm cotton is preferred by some of the cultivators and is reported to be spreading rapidly at the cost of Jayawant cotton. The Cotton Overseer, Bagalkote, sent 72 samples collected from nine different villages, which were made up of

four samples each of Jayawant and Hagari Farm. As a Technological Assistant is available at Dharwar, tests in the Laboratory were made on 18 samples only, by taking one sample of each of the two cottons from the nine different villages, while the Cotton Overseer was asked to send the remaining samples for tests to the Technological Assistant, Dharwar. The tests in the Laboratory on these 18 samples showed that the average mean fibre-length of the nine samples of Jayawant cotton was 0·870″ as against 0·836″ for Hagari. The average value for fibre-length irregularity percentage was found to be 16·2 for Jayawant as against 16·6 for Hagari. Thus, taking all the nine centres into consideration, Jayawant was found to be superior to Hagari Farm both in respect of mean length and regularity of length. Furthermore, the Jayawant cotton was found to contain, on the whole, slightly higher percentage of mature fibres than Hagari. Only in respect of fibre-weight per inch, Hagari Farm cotton was found to be slightly finer than Jayawant, the average values being 0·191 and 0·197 respectively. The difference between these values, however, is insignificantly small.

IV. TECHNOLOGICAL RESEARCH.

The following technological investigations have either been completed or were in progress during the period under review :

(1) *Pre-cleaning and ginning of Indian cottons.*—During the period under review the pre-cleaning and ginning of two cottons, namely, Verum and Sind Sudhar of the 1940-41 season, which were left over owing to the advent of the last monsoon, were first undertaken and completed. The spinning tests and fibre tests on 37 samples ginned with the different speeds and settings, etc., were also completed during the period under review.

In pursuance of the approved programme on pre-cleaning and ginning of Indian cottons, samples of seed cotton of the following seven cottons, belonging to the 1941-42 season, were requisitioned and received during the period under review :—

(1) Sind Sudhar.
(2) Surat 1027 A.L.F.
(3) P. A. 4F.
(4) P. A. 289F/43.
(5) P. A. 289F/K. 25.
(6) Verum.
(7) Tando Jan Mohammad.

In the first series of experiments which have been completed tests were made with a view to ascertaining the relative efficiency of each of the three pre-cleaning machines by single passage. In the present year, experiments are being made with a view to ascertaining the best combinations of pre-cleaning machines, taking two machines at a time. With the three machines available,

there are nine possible combinations of double passage, and all these are being tried in the Laboratory. These include double passage in each machine as well as double passage in two different machines, taking both the permutations for each combination in the latter case.

Last year, the effect of employing different saw speeds in the saw gin and different overlap settings in the roller gins were investigated. In the current year, the effect of using different rates of feed in the saw gin and different roller speeds in the roller gins are being investigated. In the saw gin five different speed steps are being tried, while in the roller gins the effect of employing three roller speeds is being investigated. In this way nine pre-cleaning and 27 ginning tests were made on samples taken from each cotton. During the period under review, these tests have been completed on four cottons, while they are in progress on the remaining three cottons namely, 289F/K. 25, Verum and Tando Jan Mohammad.

(2) *The effect of different speeds of beater and fan in the Crighton opener on the fibre properties and yarn characteristics of Indian cottons.*—This investigation is being undertaken by Mr. R. S. Koshal in collaboration with the Spinning Master. During the period under review, tests on Hubli Kumpta cotton were completed. Thus, the tests in order to ascertain the effect of employing different speeds of beater and fan in the Crighton Opener have now been completed on three Indian cottons, and the available results have been analysed. The following tentative conclusions may be drawn from the results of the tests so far carried out in connection with this investigation :—

(*a*) The waste removed by the Crighton tends to increase with the beater speed, but this cleansing power of the beater with the highest speed (1150) is found to be greater for Bengals than for 289F and Hubli Kumpta.

(*b*) There is no significant difference in the Scutcher loss and the card loss in relation to beater speed, but for each beater speed, both the Scutcher and card loss are less for two passages in the Crighton than for a single passage ; the latter is also confirmed by the results of Shirley Analyser tests carried out on the samples obtained from the Scutcher lap.

(*c*) The total waste loss upto and including the card loss is higher for the samples which were passed twice through Crighton with 1150 beater speed than for the lower beater speeds. For 289F, two passages in the Crighton brought about greater total waste loss, for each beater speed, but for Bengals and Hubli Kumpta this advantage was noticed only for the highest (1150) beater speed.

(*d*) For 289F and Hubli Kumpta the total waste loss for samples which were passed once through Crighton with 1150 beater speed is practically the same as for those which were passed twice through this machine with 950 beater speed.

(*e*) For samples, which were passed once through the Crighton Opener with 1150 r. p. m. beater speed, there is a tendency for the Crighton waste to increase with decrease in the fan speed.

(*f*) The card loss for samples of 289F and Bengals, which were passed twice through the Crighton Opener, with 950 and 1150 beater speeds, with medium fan speed is greater than with the higher fan speed.

(*g*) For samples of 289F, which were passed once through the Crighton Opener, the yarn strength is higher for 1150 beater speed as compared with 750 beater speed. Two passages in the Crighton give higher yarn strength as compared with a single passage for 750 and 950 beater speeds, for 289F. Both these conclusions can be accounted for in the light of the observed values of waste losses.

(*h*) For two passages in the Crighton and for each beater speed, there is a tendency for the medium fan speed to give higher yarn strength for Bengals.

(*i*) For two passages in the Crighton with 950 beater speed, the medium fan speed gave higher yarn strength than either the higher or the lower fan speed. The higher strength for the medium fan speed may be due to the better cleaning of the cotton, while the low strength associated with the lowest fan speed is mainly due to injury to the fibres, as shown by lower average length and greater mechanical damage.

It is proposed to carry out these tests, employing the present plan of experiments, on another good quality Indian cotton, 1027 A. L. F., after which the whole position will be considered with a view to making any changes which are deemed desirable in the plan of the experiment for further work on this problem.

(3) *Variation in the fibre properties and spinning performance of different pickings of Indian cottons.*—In accordance with the decision of the Committee samples of different pickings of the following cottons of 1940-41 season were requisitioned, and the spinning tests and fibre tests on these samples were completed during the period under review :—

(1) Umri Bani.

(2) Gaorani 6.

(3) Havre 3.

(4) P. A. 4F.

(5) P. A. 289F/43.

(6) Sind Sudhar (roller-ginned).

(7) Sind Sudhar (saw-ginned).

(8) Sind 4F-98.

(9) Sind N. R.

Furthermore, samples of Umri Bani, Gaorani 6, P. A. 4F, P. A. 289F/43, Sind Sudhar (roller-ginned), Sind 4F/98 and Sind N. R. cottons belonging to the 1941-42 season have also been requisitioned, and the tests on these samples are in progress.

(4) *The effect of employing different weights, speeds and settings of rollers and different weights of sliver in the draw frame.*—This investigation arose out of an earlier investigation which had been completed at the Laboratory. The results of that investigation, which have been published in a Technological Bulletin, showed that a small improvement in yarn strength might result from employing higher speeds of the front roller in the draw frame than those normally adopted in the Laboratory. It was, therefore, decided to examine this point further, and also to study the effect of using additional weights on the drafting rollers which might give a better control on the fibre strands with the higher speeds employed in these tests. For the purpose of these tests, three good quality Indian cottons, namely, Cambodia Co.2, Surat 1027 A. L. F. and Jayawant, were selected, and these were processed with three different speeds of the front roller in the draw frame and four different weights on the drafting rollers for each speed. The speeds employed for the front roller were 375, 475 and 525 r. p. m., while the weights used were (1) normal weights sent along with the machine, (2) additional 2 lbs. to each normal weight, (3) additional 4 lbs. to each normal weight and (4) additional 6 lbs. to each normal weight. All the tests on these three cottons employing these speeds and four weights for each speed were completed during the period under review, and the analysis of the data obtained gave the following conclusions :—

(*i*) The effect of the front roller speed on yarn strength was significant, the highest speed employed in these tests giving better results than the two lower speeds between which the difference was non-significant.

(*ii*) There was differential response between cottons and front roller speed. Thus, while for Cambodia the highest speed gave significantly better results than the lowest speed, which, in its turn, gave better results than the middle speed, for Jayawant the highest speed gave significantly better results than the other two speeds which did not differ significantly in this respect. For 1027 A. L. F., on the other hand, the highest and the middle speeds gave significantly better results than the lowest speed.

(*iii*) There was differential response between the counts and the front roller speeds. Each sample was spun into 20s and 30s

counts and it was found that while for 20s counts the highest speed gave significantly stronger yarns than the middle speed which in its turn gave stronger yarns than the lowest speed, for 30s counts the highest speed gave significantly stronger yarns than the other two speeds between which the difference was not significant.

(*iv*) The different additional weights employed in these tests did not have any significant effect on yarn strength. This result holds only if we take all the cottons and all the speeds collectively into consideration. It was, however, noticed that there is differential response to a small extent between the weights and the front roller speeds.

It is proposed to continue this investigation with other Indian cottons as well to study the effect of changing the weight of the sliver and the settings of the rollers.

(5) *Comparative spinning tests between the mills and the Laboratory.*— In response to the circular letter issued by the Secretary, Millowners' Association, Bombay, 12 samples of cotton used by the mills along with samples of their scutcher laps, card sliver, draw frame sliver and roving bobbins had been received for tests at the Laboratory. Out of these, tests had already been completed on samples belonging to nine cottons. During the period under review tests were completed on the samples of the remaining three cottons, and a detailed report was placed before the Committee at its meeting held in July 1941. It was found that the average difference between the mill tests and the Laboratory tests for counts above 20s may be taken as 10 per cent., the Laboratory tests being higher, though for the coarser counts this difference may be even more. It may be stated in this connection, that seven out of the nine mills who supplied these samples were located in Bombay, and, therefore, this comparison holds valid mostly for the Bombay mills. On a consideration of these results it was decided by the Committee that it would be useful to explore the causes of the large differences observed between some of the mills and the Laboratory tests, especially with the coarser counts. Accordingly, personal contacts were established during the period under review with two mills for which such large differences had been observed between their tests and the Laboratory tests. It was found that in the case of the first mill in which P. A. 4F had been used giving a difference of nearly 25%, the mill had prepared 8 bobbins in the sliver, 4 in the inter and 2 in the rover and only 1 bobbin in the ring frame and that only one lea had been tested from the last bobbin. It would be seen that a very large sampling error can result by adopting this technique, and it seems highly probable that the difference observed between the mill test and the Laboratory test was largely, if not wholly, due to the sampling error. It is, however, possible that some of the observed difference may also have been due to the difference in relative humidity prevailing in the mill and the Laboratory, as it was found that the humidity in the spinning room of the mill was about

6 per cent. lower than that prevailing in the Laboratory, while no record was maintained in the mill of the humidity prevailing in its testing room. In order to ascertain the effect of sampling, the mill management was requested to send to the Laboratory 10 roving bobbins from another mixing which was being processed at the time, and they were also asked to make a sufficiently large number of tests on the yarns spun from this mixing. Yarns were spun at the Laboratory from the roving bobbins sent by the mill, and these along with the yarns spun at the mill were tested at the Laboratory. The results of the two tests agreed fairly well showing that, when the testing conditions adopted in a mill agree with those followed at the Laboratory, large differences between the two tests are not likely to occur. These tests also bring to the forefront the necessity of employing a technique by the mills in testing their yarns which should not involve large sampling and experimental errors. The fact that cotton is a highly variable material is sometimes lost sight of, and conclusions are drawn from inadequate data. In view of the high degree of variability of cotton in most of its properties, it is absolutely essential that the number of tests carried out should be sufficient to give a fairly reliable mean. This method may involve a little extra time, but if due care is not paid to this point the insufficient number of tests carried out may be worse than useless as they may yield quite misleading results.

In the case of the second mill, Broach (Jambusar) cotton had been spun and tested in 12s counts, and a difference of nearly 34% had been observed between the mill and the Laboratory test. The conditions prevailing at the time of processing this cotton in the mill were very carefully compared with those prevailing in the Laboratory. It was found that although in several respects these conditions were similar in the two places; they, however, differed in two important respects. In the first place, the twist multipliers used by the mill in the speed frames were appreciably higher than those normally employed in the Laboratory. Secondly, the relative humidity prevailing in the mill was, on the average, 21% lower than that prevailing at the Laboratory. It seemed highly probable that the large differences observed between the mill test and the Laboratory test was due partly to sampling and partly to the effect of these two factors. It was intended to pursue this matter further and to ask the mills to undertake some more comparative tests. It has not, however, been possible to fulfil this intention as many of the mills are now working at high pressure on the production of clothing materials required for defence purposes and they find it very difficult to set aside any of their machines for the purpose of carrying out experiments.

(6) *Prediction of the spinning value of cottons from their fibre properties, with special reference to the Gujarat cottons.*—This investigation is being undertaken by Mr. Hari Rao. It has already been stated that for this purpose the Indian cottons have been divided into four different groups, namely, (1) inferior Indian cottons which generally spin below 20s standard warp counts, (2) good-quality Indian cottons grown in India except those belonging to the Surat-Broach tract, (3) exotic cottons grown in India, and (4)

strains peculiar to the Surat-Broach tract. Work on the first two groups had already been completed, while during the period under review most of the experimental work on the remaining two groups was also completed. In each group about 40 cottons have so far been tested in a very thorough manner for their fibre properties in relation to their spinning performance. New regression equations have been worked out for cottons lying in each group. So far as the cottons grown in the Gujarat tract are concerned, it has been found that the agreement between the calculated and the actual values is much better with the new regression equation involving mean fibre-length, fibre-weight per inch and swollen hair diameter than with the old equation. Thus, with a knowledge of these three properties it is now possible to predict the probable spinning performance of the Gujarat cottons with a fair degree of reliability. When a similar regression equation was worked out for the exotic strains, the improvement in the agreement between the calculated and the actual values of spinning performance was not appreciable. It was, however, noticed that cottons possessing fairly high values of length irregularity percentage were generally those which gave large differences. Consequently, a new regression equation was worked out in which the effect of fibre-length irregularity percentage was also taken into account, and this equation showed some improvement over the previous one. It would thus appear that, in the case of these cottons, length irregularity percentage, or a similar property related to it, can account to some extent for the variation in their spinning performance. In order to find out whether it may be possible to effect further improvement in this equation by taking into consideration the strength of the fibres, strength tests were commenced, and have been completed on 17 cottons. When the results for all the 36 cottons are available, the effect of fibre-strength on the variation in the spinning performance will be investigated.

In view of the improvement noticed with the exotic strains by including fibre-length irregularity percentage in the regression equation, a new equation involving this property was also worked out for the second group of cottons, namely, the superior Indian strains and was found to give a slightly better agreement than the old equation.

(7) *Study of the causes of variation in copper number of cottons stored under different climatic conditions.*—This investigation arose out of an earlier investigation in which a large number of bales of cotton of different varieties had been stored for two years under conditions of humidity and temperature normally prevailing in Bombay. As the copper number of the samples taken out at regular intervals from these bales was found to behave in an erratic manner, it was decided to investigate this point further with a view to clarifying the position. For this purpose samples of (1) uncleaned raw cotton, (2) hand cleaned raw cotton, (3) de-waxed cotton and (4) de-pectinised cotton were stored at a constant high humidity, and their copper number, cuprammonium fluidity and bundle fibre-strength were determined at regular intervals. It was found that in the case of the uncleaned raw cotton the copper number and the bundle strength decreased while cuprammonium fluidity increased

with storage. A similar trend was also observed for the hand cleaned sample, but the range of variation was found to be much less, for the same period of storage, than for the uncleaned cotton. In the case of the de-waxed cotton the cuprammonium fluidity was found to remain practically constant, the copper number decreased, while the bundle strength recorded a slight increase. In the case of the de-pectinised cotton, cuprammonium fluidity increased slightly, the copper number showed a very considerable decrease and the bundle strength remained practically constant. One noteworthy feature of the de-pectinised sample was that even after storage of three months over high humidity it did not show any visible attack of fungi or the emission of the characteristic sourish or sweet-sourish smell given out by the other three samples.

The results obtained with these four types of treatment show that the observed variation in copper number was due mainly to changes occurring in the pectinous substance and to a smaller extent in the waxes present on the cotton fibres. Furthermore, it is possible that some of the products of degradation of the pectinous or the waxy substances might bring about a slight increase in fibre-strength, though this point needs further investigation by experiment. Furthermore, a comparison of the behaviour of the uncleaned and the hand cleaned samples under similar conditions of storage showed that the latter underwent a much smaller amount of degradation as shown by changes in copper number, cuprammonium fluidity and bundle strength, thus emphasising the advantages of storing cotton in as clean a condition as possible. It may be mentioned here that a similar difference in gloss percentage was also observed in the main investigation between the samples drawn from the bales at regular intervals and the clean samples stored in the laboratory.

This investigation has been completed and a full account of it is now being written up for publication.

(8) *Study of relationship between wax content, feel and fibre weight per inch of cotton.*—This problem has been entrusted to Mr. C. Nanjundayya and has been completed during the period under review. A large number of cottons have been examined for their wax content, fibe-weight per inch and ribbon-width, while the data available for other cottons has also been utilised in determining the relationships between the characters mentioned above. The following conclusions, drawn from this work, may be mentioned :—

(*a*) When the same set of cottons are examined by different graders with regard to feel, a certain amount of divergence may exist between their valuation. This is partly due to the personal factor involved in assessing this property and partly to its complex nature.

(*b*) Of the various fibre characters which contribute to the feel of a cotton, the fineness of the fibre is found to take the first place of importance, the wax content takes the second place, while the surface structure takes the third place.

(*c*) A formula has been worked out by means of which it is possible to estimate the wax content of a cotton from a knowledge of its fibre-weight per inch and ribbon-width. In general the calculated values are found to agree well with the experimental values, but in some cases the differences between the calculated and the experimental values of wax content are fairly large, and it would be necessary to explore the causes for these large differences.

(*d*) A close parallelism is found to exist between the wax content of cottons and their feel as estimated by the grader. Since it has been found that the wax content can be estimated from a knowledge of some of the fibre-properties, it follows that the feel of a cotton can be expressed, in most cases, in terms of these properties.

(*e*) The relationship between the fibre characters and the feel of cottons indicates that cottons with a high degree of fibre-maturity would, on the whole, have a slightly harsher feel than the immature cottons. Since fibre immaturity has been found to exercise deleterious effects on yarn characters, it follows that special care should be devoted towards evolving strains which combine normal maturity with a not too high fibre-weight per inch. In the earlier stages of evolution of new strains, the determination of fibre-weight per inch and maturity and in some cases fibre-diameter would be enough to give a fairly good estimate of the feel of the cotton. Later on, when the field selection has been narrowed down, the determination of wax content, which is a more time-absorbing operation, would give additional useful information.

(9) *The influence of swollen hair diameter on the spinning quality of cottons with special reference to Arboreum cottons.*—This investigation has been entrusted to Mr. R. S. Koshal. During the period under review the statistical analysis of the results obtained for 42 samples kindly supplied for this investigation by the Geneticist and Botanist, Institute of Plant Industry, Indore, was completed. This analysis gave the following results :—

(1) The variation between varieties was significant with respect to both fibre-weight per inch and swollen hair diameter, but the block to block variation was not significant.

(2) Among the seven cottons forming the material of this investigation, Jarila cotton gave the lowest value of swollen hair diameter and fibre-weight per inch and this feature was reflected in its spinning performance which was highest among these cottons.

(3) There is a positive correlation between fibre-weight per inch and swollen hair diameter showing that finer varieties, as judged

by fibre-weight per inch, are in general characterised by lower swollen hair diameter.

(4) The correlation between the highest standard warp counts with swollen hair diameter on the one hand and the fibre-weight per inch on the other, are both negative and significant. Since, however, the number of samples was only 7, it was not possible to find out which of these two properties bore higher correlation with the spinning performance.

In order to assess the relative importance of these two properties in distinguishing closely allied strains, it is necessary to examine a larger number of varieties grown in accordance with a well-designed plan. Material satisfying these conditions has been kindly promised by the Geneticist & Botanist, Institute of Plant Industry, Indore, and is awaited in order to complete this investigation.

(10) *Study of the fibre-properties of cotton in relation to its seed characters.* —This investigation was undertaken by Mr. A. N. Gulati and has been completed during the period under review. An account of this investigation has also been written up, and the following conclusions drawn from this investigation may be stated :—

(*i*) Fibre-maturity is found to be highly variable from seed to seed, while swollen hair diameter shows the least variation.

(*ii*) Seed weight appears to be the determining factor for lint-weight, mean fibre-length, unit hair weight and fibre-maturity.

(*iii*) Increase in lint-weight is brought about by increase in both unit hair weight and hair population and not by a change in only one of these two characters.

(*iv*) Further evidence has been obtained in support of the view that the lengthening and thickening phases of fibre development overlap for a short period of time. This overlapping appears to take place either in the later stages of fibre elongation or in the earlier stages of secondary thickening. The latter seems to begin first in those fibres which are sprouting near the micro-phylar end of the seed.

(*v*) A new method of determination of hair population has been developed which consists of dyeing a known number of hairs from the lot, mixing them thoroughly with the rest of the population and determining the frequency of dyed hairs in a few tufts of the lot to calculate their total number.

(11) *Determination of the constants for finding the standard hair weight of Indian cottons.*—This investigation has been undertaken by Mr. R. L. N.

Iyengar. During the period under review the maturity tests were completed on 14 Indian cottons bringing the total number of cottons examined for the purpose of this investigation to seventeen. These cottons extended over a wide range in respect of fibre-maturity, five of them being highly immature, six highly mature and six possessed medium fibre-maturity. It is found that in spite of such large variation in the fibre-maturity of these cottons, the mean value of the ratio, $1 - \frac{d^2}{D^2}$, where d is the diameter of the lumen and D the diameter of the fibre, varied slightly from cotton to cotton. Work on some more Indian cottons of each type is in progress.

(12) *Efficiency of kier boil and bleach treatments and comparison of kier boil with different concentrations of caustic soda and soda ash.*—During the period under review the tests on the remaining 50 samples belonging to the third series of investigations were completed both at the Department of Chemical Technology and in the Laboratory. The results of these tests were scrutinised and it was found that the number of turns per inch in the yarns to which different treatments were given varied over a small range. In order to see whether this variation in the number of turns per inch in the yarns had any influence on the absorption of the alkali or the bleach liquors, 12 samples of yarn were spun in the Laboratory from the same cotton with different twist multipliers and were sent to the Department of Chemical Technology for the necessary kier boil and bleach treatments. Furthermore, it was found necessary to repeat some of the cuprammonium fluidity measurements in order to clarify the relationship between variation in this property and variation in yarn strength. These tests together with those on the yarns spun from different twist multipliers are in progress.

During the period under review the paper on the second series of experiments dealing with the part of investigation, which has been completed, was practically written up and will shortly be ready to be sent up for publication.

(13) *Alternative uses for Indian cottons.*—

(*a*) *Sugar bags.*—A report on the cotton bags prepared by a local mill which were treated in the Laboratory to render them less permeable to moisture was received during the period under review from the Director, Imperial Institute of Sugar Technology, Cawnpore. It will be remembered that these bags were given two different treatments which will be designated by A and B. The tests on these bags in the Imperial Institute of Sugar Technology were commenced in April 1941 and were completed by the end of October 1941. In these tests the behaviour of these bags was compared with that of jute bags ordinarily used for the purpose of storing sugar under two conditions of storage, namely, in a closed wooden chamber and in the godown of the Experimental Sugar Factory. Samples of sugar from these bags were analysed every fortnight for poly-saccharose, invert sugar and moisture

content, and the following table gives the final readings for variations in these characters :—

TABLE VII.

From April to October.	In the closed chamber			In the godown		
	Jute bag	Cotton bags		Jute bag	Cotton bags	
		A	B		A	B
Fall in pol	0.20	0.07	0.10	0.17	0.18	0.25
Increase in invert sugar ..	0.0162	0.0076	0.0092	0.084	0.066	0.078
Increase in moisture	0.018	0.009	0.012	0.076	0.086	0.142

It will be noticed that in the closed chamber both types of cotton bags gave better results than the jute bags. In both cases the fall in poly-saccharose, the increase in invert sugar and the increase in moisture were less with the cotton bags as compared with the jute bags. In the factory godown, however, the two types of bags behaved somewhat differently. Under the conditions of storage prevailing in the godown, the bags to which treatment A had been given proved just as satisfactory as the jute bags but the bags to which treatment B had been given proved rather less satisfactory. It would, therefore, appear that under conditions of storage normally prevailing in a factory godown during six months—April to October 1941—the behaviour of the cotton bags to which treatment A had been given was just as satisfactory as that of the jute bags. As regards the durability of these cotton bags, the Director of the Imperial Institute of Sugar Technology, Cawnpore, reported that " the cotton bags could withstand the pressure of 40 bags of sugar without any damage to the cloth. It was, however, noted that the stitching along the sides of the bags was not strong enough and that it gave way when loads heavier than 30 bags were placed over them." It should not be a difficult matter to prepare bags with stronger stitching along the sides.

(*b*) *Filter cloth for sugar factories.*—The previous tests carried out in connection with this investigation had indicated the specifications of a type of cloth which might be satisfactory for this purpose. During the period under review arrangements were made with one of the local mills for spinning a sufficient quantity of yarn of the required counts and strength and with a local technical institution for weaving this yarn into cloth of three different constructions so that the necessary tests as regards shrinkage, permeability, strength, etc., may be carried out on these cloths. The weaving of one type of cloth has been completed, and the necessary tests on it will be made, while the weaving of the other types of cloth is in progress.

(*c*) *Use of cotton fabric in road construction.*—It will be remembered that arrangements were made with the Bombay Municipality for constructing two

lengths of road, one according to the ordinary technique employed by them and the other with a cotton fabric used as reinforcing material. These road lengths measuring 500 feet have been under observation since April 1941 and the City Engineer, Bombay Municipality, was requested to give his interim report on the performance of these roads. He has reported as follows :—

> "I have personally inspected the roads where cotton fabric was used as re-inforcing agent. Only one monsoon has passed and I am afraid that it is too early to give definite opinion thereon. I might say that from surface examination, I find that wearing surface is not standing as it should and might show definite signs of wear in a year or so."

It will be seen from this report that the wearing surface of the road in which the cotton fabric was used as re-inforcing material is not standing as it should, and it would be necessary to wait for another year to see whether or not the fear expressed by the City Engineer that this road may show definite signs of wear is borne out by observation. After one more monsoon the City Engineer may be in a position to give his final report on these roads.

(*d*) *Cotton cloth cover for cotton bales.*—This investigation was undertaken in pursuance of the decision of the Committee at its meeting held on the 17th and 18th January 1941 and has been carried out by Mr. C. Nanjundayya. It will be remembered that for the purpose of this investigation two bales each of P. A. 289F and Cambodia Co.2 were received, one bale of each cotton having been covered with jute hessian while the other bale was covered with cotton fabric. The cotton fabric used for covering the bale of P. A. 289F was made in a mill in U. P., while the other one used to cover the bale of Co.2 was prepared in a mill in South India. These bales were stored with their kind permission in the godown of Messrs. Bachhraj & Co., at Sewri, who gave all facilities for taking fortnightly readings for weight and general appearance of the bales. These readings have now been continued for a year and during this period the bales were handled 24 times. The following conclusions may be drawn from the observations made so far :—

(*i*) The cotton cloth covering of the Cambodia Co.2 bale was strong and not only withstood well the journey from South India to Bombay, but also the frequent handling in the godown for taking readings on the weights without suffering any serious damage. In fact in this respect it lasted even better than the jute hessian cover which has developed some cuts and tears near the hoops as a result of the repeated handling at fortnightly intervals. It would thus appear that this type of cotton fabric is quite suitable for covering cotton bales, and is able to last well even after frequent or rough handling.

(*ii*) Both bales of P. A. 289F were received in Bombay in a damaged condition, the bale with cotton cover having suffered greater damage than the bale with the hessian cover. As a result of the frequent handling of the bales in Bombay the bale covered

with the cotton cloth developed cuts and tears at several places. In actual practice such tears and cuts would expose the cotton to loss in quantity or grade. It would thus appear that this type of cotton fabric is not suitable for covering bales, especially if they have to undergo long journeys or frequent handling.

(*iii*) The absorption and desorption of moisture during the storage for one year under Bombay conditions of temperature and humidity were practically the same for bales covered with cotton cloth and jute hessian.

(*iv*) A few spots of rust were noticed towards the end on the cotton cloth near the iron hoops, but the rust had not penetrated to the lint below the cloth.

(*v*) There were no attacks by rats or insects on the bales covered with cotton cloth.

(14) *Work on Indian linters.*—This work was undertaken by Dr. Lavji Thoria. During the period under review seven standard grades of American linters received from the United States Department of Agriculture were analysed mechanically and chemically with a view to correlating the results of this analysis with those obtained for the Indian linters. Furthermore the percentages of fibres of different group-lengths present in the American standard grades were also determined. The results obtained showed that the invisible loss found in the mechanical analysis is very nearly equal to the proportion of fibres having lengths of 1/16″ and less. It was, furthermore, found that the invisible loss can serve as an index of the staple of the sample concerned, the lower the invisible loss the longer the staple of a cotton. The work on the Indian linters of two seasons, 1939-40 and 1940-41, was completed during the period under review and a detailed report has been written up for publication.

Work was also continued on the problem of bleaching linters so as to find the optimum conditions. Kier boiled linters were bleached for different durations, starting with the same amount of available chlorine, and quantity of chlorine consumed and the change in hydrogen ion concentration, if any, were noted. The resulting material was tested for degradation and whiteness in each case. Another series of bleaching treatments was carried out in which the amount of available chlorine at the start was varied, while the duration of bleach was kept constant. Tests for degradation and whiteness on the resulting material are in progress. It is proposed to apply and extend the result of this investigation to cotton yarns.

During this period the pilot plant ordered from the U. S. A. for semi-factory scale experiments on the manufacture and grading of chemical cotton from Indian linters was received in the Laboratory. As the building for housing this plant is not yet ready, arrangements have been made for storing

it, and in this connection I must thank the Principal of the Victoria Jubilee Technical Institute, Matunga, Bombay, who very kindly agreed to store the big cases, for which there was not adequate room in the Laboratory, in his Institute.

V. GINNING SECTION.

An account of the work done in this Section during the period under review has already been given and will be found on page 20. It may be briefly stated here that during the period with which this report deals, work has been carried out on the pre-cleaning problems by passing samples of Indian seed-cottons in a combination of two pre-cleaning machines while on the ginning side, work has been concentrated upon investigating the effect of using different rates of feed in the saw gin and different speeds of the front roller in the roller gins. There have been no additions to the equipment in this Section during the period under review, but a certain amount of attention has been devoted to devising an automatic feed control for the saw gin. Another noteworthy feature in regard to the tests carried out in this Section is the inclusion of moisture tests on all samples of seed-cottons as well as lint which were either pre-cleaned or ginned in this Section. This work involved the carrying out of moisture tests on a large number of samples and was made possible by using the Shirley Moisture Meter, the work being done by Mr. R. L. N. Iyengar.

VI. MOISTURE TESTING SECTION.

During the year under review tests for determination of moisture content of samples of cotton, yarn and cloth were carried out on 304 samples as detailed below :—

(1)	Technological samples	177
(2)	Trade samples	127

The total number of samples tested in this Section since its inception in 1931 is 1766, but this figure does not include 171 samples of coir yarns on which moisture tests were made in connection with an investigation carried out on behalf of the Agricultural Marketing Adviser to the Government of India, New Delhi, in 1941.

VII. PUBLICATIONS.

The following publications were issued from the Laboratory during the period under review :—

(1) *Technological Bulletins, Series A, Nos. 53 and 54.*—

(*i*) Technological Bulletin, Series A, No. 53, "Technological Reports on Trade Varieties of Indian Cottons, 1941," by Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F. Inst. P., J.P.

(*ii*) Technological Bulletin, Series A, No. 54, "Technological Reports on Standard Indian Cottons, 1941," by Nazir Ahmad, O.B.E., Ph.D. (Cantab.), F. Inst. P., J.P.

(2) *Technological Bulletin, Series B, No.* 31, entitled "The Influence of Environment on Yield, Seed, Lint and Fuzz of the Punjab-American Cottons, 4F and 289F/43, by A. N. Gulati, M.Sc.

(3) *Technological Circulars, Nos. 475-511 as per list shown below :—*

Circular No.	Title.	Date of publication.
475	Technological Report on Verum 262 (Nagpur), 1940-41 ..	June 1941.
476	Technological Report on Late Verum (Nagpur), 1940-41 ..	,, ,,
477	Spinning Test Report No. 1336 on a sample of Cambodia Cotton, 1940-41	,, ,,
478	Spinning Test Report No. 1337 on a sample of Karunganni Cotton, 1940-41	,, ,,
479	Technological Report on 289F/K. 25, 1940-41	,, ,,
480	Technological Report on Cambodia Co.2 (Cambodia 440), 1940-41	,, ,,
481	Technological Report on Gaorani 6, 1940-41	July 1941.
482	Spinning Test Report No. 1342 on Samples of Broach Cotton, 1940-41	,, ,,
483	Spinning Test Report No. 1343 on Samples of Jayawant Cotton, 1940-41	,, ,,
484	Spinning Test Report No. 1344 on Samples of Upland Cotton, 1940-41	,, ,,
485	Technological Report on Jayawant (Kumpta), 1940-41 ..	,, ,,
486	Spinning Test Report No. 1345 on Samples of Navsari Cotton, 1940-41	,, ,,
487	Spinning Test Report No. 1353 on Samples of Farm Westerns Cotton, 1940-41	Aug. 1941.
488	Spinning Test Report No. 1354 on Samples of A. R. Kampala Cotton, 1940-41	,, ,,
489	Technological Report on Sind-Sudhar (289F-1) 1940-41 ..	,, ,,
490	Spinning Test Report No. 1355 on Samples of Kadi-Viramgam Cotton, 1940-41	,, ,,
491	Spinning Test Report No. 1356 on Samples of A. R. Busoga Cotton, 1940-41	,, ,,
492	Spinning Test Report No. 1358 on Samples of A. R. Jinja Cotton, 1940-41	,, ,,
493	Technological Report on Punjab-American 4F, 1940-41 ..	,, ,,
494	Spinning Test Report No. 1364 on Samples of Bijapur Cotton, 1940-41	Sept. 1941.
495	Technological Report on Jarila, 1941-42	Feb. 1942.
496	Technological Report on Umri Bani 1941-42	,, ,,
497	Technological Report on Late Verum (Nagpur), 1941-42 ..	March 1942.
498	Technological Report on V. 434 (Akola) 1941-42	,, ,,
499	Spinning Test Report No. 1445 on samples of Jagadia Cotton, 1941-42	April 1942.
500	Spinning Test Report No. 1446 on Samples of Berar Cotton, 1941-42	,, ,,

Circular No.	Title.	Date of publication.
501	Spinning Test Report No. 1449 on Samples of C. P. No. 1 Cotton, 1941-42	April 1942.
502	Spinning Test Report No. 1450 on Samples of Punjab-American 4F Cotton, 1941-42	,, ,,
503	Spinning Test Report No. 1451 on Samples of L. S. S. Cotton, 1941-42	,, ,,
504	Spinning Test Report No. 1452 on Samples of Broach Cotton, 1941-42	,, ,,
505	Spinning Test Report No. 1453 on Samples of Farm Westerns Cotton, 1941-42	,, ,,
506	Spinning Test Report No. 1456 on Samples of Westerns Cotton, 1941-42	,, ,,
507	Spinning Test Report No. 1459 on Samples of Sind Sudhar Cotton, 1941-42	,, ,,
508	Spinning Test Report No. 1460 on Samples of Punjab-American 289F/43 Cotton, 1941-42	,, ,,
509	Spinning Test Report No. 1461 on Samples of Khandesh Cotton, 1941-42	,, ,,
510	Spinning Test Report No. 1462 on Samples of Verum Cotton, 1941-42	,, ,,
511	Spinning Test Report No. 1473 on a sample of Hubli Jayawant Cotton, 1941-42	May 1942.

In addition the following three papers were contributed to the 29th Session of the Indian Science Congress held at Baroda in January 1942 :—

(1) Estimation of Spinning Value of Indian Cottons from their fibre-properties, by H. Navkal and Nazir Ahmad.

(2) Determination of the Maturity Co-efficient for Indian cottons, by R. L. N. Iyengar and Nazir Ahmad.

(3) The Effect of differential irrigation on the field behaviour and quality of P.A. 4F, by Mohammad Afzal and Nazir Ahmad.

Brochure on Technological Research on Cotton in India.—It will be remembered that in 1934 the Indian Central Cotton Committee decided that a brochure should be brought out giving a connected account of all the work done at the Laboratory since its inception. This brochure was published in 1935. Since the publication of this brochure in 1935 as a good deal of work, including the completion of several technological investigations had been done at the Laboratory, the Committee decided in 1940 that a revised edition of this brochure bringing it up to date should be published. In accordance with this decision a connected account of the work done at the Laboratory between 1935 and 1941 was incorporated in the earlier edition, and a revised edition giving an account of all the work done at the Laboratory

between 1924-41 was published in February 1942. Arrangements have been made for distributing copies of this brochure to those connected with improving the cultivation of cotton, with the textile industry and the cotton trade.

Summaries of Technological Bulletin, Series B, No. 31 and of the three papers read at the Science Congress are given below :—

Technological Bulletin, Series B, No. 31, "*The influence of environment on yield, seed, lint and fuzz of the Punjab-American cottons, 4F and 289F/43.*— Six samples each of 4F and 289F/43 cottons grown under three frequencies of irrigations and two rotations, namely fallow and berseem at Risalawala (Lyallpur, Punjab) Farm, were tested for seed weight, lint weight, staple length, unit hair-weight, maturity percentages and the weight of fuzz per seed, with a view to studying the influence of the above agronomical factors on these properties. This material belonged to a failure crop caused by *Tirak* and was deliberately selected for the present investigation because it was expected to provide material with a maximum amount of modification in seed and fibre characters due to *Tirak*.

In the course of this study it was found that 4F had five types of morphologically different seeds such as brown sparsely fuzzy, brown naked, black sparsely fuzzy, black naked and grey fuzzy. Similarly the seeds of 289F/43 could be split up into seeds with coloured fuzz, grey fuzz, and sparse fuzz on both black and brown seeds. The proportion of grey fuzzy seeds among them was preponderatingly large (85-95%). They were further divided into three grades of size, such as small, medium and large. The relative proportion of each of the five types of seed of 4F and three grades of seed of 289F/43 was determined both by number and weight and the various tests were also made on the lint borne by these types of seed. This study yielded the following conclusions :—

(1) The yield data showed that the crop was an utter failure under light and medium irrigations, but was almost normal under heavy irrigation so that the effect of *Tirak* was restricted to light and medium irrigations.

(2) The presence of five types of seed in 4F and four types in 289F/43 showed the heterogeneous nature of seed of both cottons, and the history of their origin also did not preclude their hybrid constitution. As most of the seeds of 289F/43 were of one type, it is suggested that other types of seed be eliminated at each sowing lest it hybridises too much with other types of seed and loses its good characters.

(3) The failure of crop due to *Tirak* resulted in the production of a very large number of immature brown seeds (64%) under light and medium irrigations in 4F, but they were reduced to 47% under heavy irrigation. The presence of such seeds even in a normal sample indicated other causes of their origin than *Tirak*. A suggestion to investigate that they may also be produced

by Mendelian inheritance is made in view of a similar finding by Harland (1926) in American Egyptian cottons.

(4) The lint borne by brown seeds of 4F in particular and the general samples under light and medium irrigations were sub-normal in respect of all fibre properties and even seed and lint weight. The ill effects of *Tirak* were, however, got over under heavy irrigation which pulled up the fibre properties and seed and lint weights of both cottons to very near the normal values. The remedial effect of heavy irrigation supplying water at fortnightly intervals against the occurrence of *Tirak* was observed.

(5) Studies on immature seeds of 4F showed that lengthening and thickening phases of development of cotton hairs were not sharply demarcated but overlapped over a certain period. It was observed that thickening of cell wall so as to make a hair classified as mature could even be completed on brown seeds before the normal length was fully attained.

(6) The three ripe types of seed of 4F could not be differentiated in respect of any property studied for this investigation except lint weight which just approached significance limits in the case of black naked and grey fuzzy seeds.

(7) In 289F/43, seed size was positively correlated with seed-weight, lint-weight, staple length, unit hair-weight and fuzz weight but was negatively related with ginning percentage. A similar trend was recorded by Turner (1929) in 4F seeds for all the properties noted above except the fuzz-weight.

(8) High ginning percentage was associated with small seeds of 289F/43, and with immature seeds of 4F which were also small. Ginning percentage appeared to correspond well with the number of hairs per seed in some cases. It also increased under heavy irrigation in split samples of 289F/43, possibly due to equal representation of different grades of seed in the mean values.

(9) Rotations did not affect any property in 4F ; but in 289F/43 fallow increased the mean seed weight, lint weight, hair weight and staple length in bulk samples.

(10) The weight of fuzz varied with the type of fuzziness of seed in 4F and was directly related to size of seed in 289F/43.

Abstracts of the three papers read at the Science Congress.

(1) "*Estimation of spinning value of Indian cottons from their fibre-properties.*"—The best method of judging the quality of a cotton is by spinning it under standard conditions. Where this is not possible, the spinning value can be estimated from fibre characters, provided the regression equation connecting these with the former is known.

The relationship between yarn strength and fibre properties has been investigated by a number of scientists including Turner and Venkataraman at the Technological Laboratory and in this paper their work has been carried a stage further. It is shown that strains grown in India could be divided into four broad classes (1—4) each having certain characteristic fibre properties. The advantage of having a separate prediction formula for each group is discussed. It is suggested that a breeder while continuing to select for length should bear the following additional points in mind :—

(1) Selection work on *inferior* strains (spinning less than 20 counts) should be conducted on the basis not only of a lower fibre-weight per inch but also of a higher $\frac{\text{length}}{\text{diam. or fibre wt. per in.}}$ ratio.

(2) For *exotic* cottons a low fibre-diameter and a high maturity percentage are desirable.

(3) Samples whose fibre-length irregularity percentages are very high will not spin as well as expected from their other fibre properties.

(4) Some of the *strains peculiar to Gujarat* are very coarse, and their coarseness detracts them considerably from their value ; consequently attention should be concentrated on improving their fineness as well as their length.

(2) *Abstract of the paper entitled "Determination of the Maturity Co-efficient for Indian Cottons."*—The use of the Constants derived by Peirce and Lord for the calculation of the maturity co-efficient in the case of work done in India is open to two objections :—(1) The range of cottons dealt with by them is different and (2) the method of estimation of fibre maturity is somewhat different from Clegg's method. It is, therefore, necessary that for the Indian cottons the Constants have to be determined separately and the present paper deals with the preliminary work so far done on this subject.

The maturity of each fibre is first determined using Gulati and Ahmad's technique. Next the diameter of the swollen fibre, D, and the diameter of the lumen, d, are determined. If the density (P) of the swollen cellulose is assumed to be practically constant inside fibres of all grades of maturity, the expression, $1-\frac{d^2}{D^2}$, represents the ratio of weight of a fibre to the weight it would have had if it were completely mature. The mean value of this ratio for each maturity gives the corresponding constant. In the six cottons so far examined it is found that the values of these constants are approximately 0·97 for the mature class, 0·80 for the half-mature class and 0·55 for the immature class. The maturity co-efficient is, therefore, given by

$$\frac{0\cdot97\,M+0\cdot80\,H+0\cdot55\,I}{100}$$

That this expression is more suitable for the Indian cottons is shown by the following table :—

Mature Fibre-Weight in 10^{-6} *gms.*

No.	Cotton.	$\frac{\pi}{4}D^2P$	Fibre-weight ÷ maturity coefficient.	
			Present value.	Peirce and Lord's New Formula.
1	X 3915 Q	1.75	1.66	2.01
2	47F	1.86	1.84	2.27
3	1027 A. L. F.	2.87	2.90	3.14
4	Koilpatti I	2.32	2.12	2.40
5	Jarilla	2.23	2.11	2.28
6	Verum 262	1.86	1.85	2.09

It will be seen that the fibre weight divided by the present value of the maturity coefficient agrees remarkably with the value obtained from the microscopical dimensions. The figures obtained by using Peirce and Lord's new formula are considerably higher.

From the measurements made in this work the following additional conclusions can also be drawn :—

1. The distribution of the fibre weight per unit length is nearly normal in each maturity class as well as for the whole sample.
2. The fibre weight per cm., calculated from value of D^2-d^2, agrees very well with the observed value.
3. The values of the Constants, which can also be derived from the mean fibre weight for each maturity class, are found to agree with those obtained above.
4. The distribution of fibre diameter is normal both within each maturity class and for the whole sample. For each cotton the mean value of the diameter found is to be practically the same for all the three classes.
5. Though the distribution of the wall thickness is normal in each maturity class, for the whole sample it is heterogeneous.
6. Within each maturity class there appears to be a positive correlation between diameter and wall-thickness. For the whole sample, however, the correlation appears to be negligible on account of the heterogeneous distribution of the wall-thickness.

(3) *Abstract of paper entitled "The effect of differential irrigation on the field behaviour and quality of P. A. 4F.", by Mohammad Afzal and Nazir Ahmad.*

Flowers and bolls produced per plant were not correlated with the quantity of water given to the crop; but, in general the yield was correlated with watering. Ridging *versus* flat sowing gave indifferent results.

Application of more water during the growing period is likely to improve, to a small extent, the mean fibre-length of P. A. 4F. The amount of irrigation applied to the crop did not produce any significant effect either on the mean fibre-weight per inch or the standard hair-weight of this cotton. The percentage of mature hairs in P. A. 4F showed a tendency to increase with the amount of water supplied to the crop.

The spinning performance of this cotton showed a small tendency to improve as more water was given to the crop. It is noteworthy, in this connection, that the zamindari system of irrigation and its two variants compared favourably in respect of spinning performance of the lint with the type which represented the highest amount of irrigation.

VIII. GENERAL.

Visitors.—During the period under review a large number of people connected with textile trade, cotton industry and scientific research and agriculture, visited the Laboratory and among them the following may be mentioned :—

(1) The Secretary, Indian Central Jute Committee, Calcutta.
(2) The members of the Textile Association (India), Bombay.
(3) Students of the Chemical Technology Department, Kala Bhavan Technical Institute, Baroda.
(4) Students of the S. K. S. J. Technological Institute, Bangalore.
(5) Staff members of three local mills.
(6) Students and Staff members of the Seth D. N. Agricultural Institute, Baroda.
(7) Students of the Govt. Central Textile Institute, Cawnpore.
(8) Students of the Government Commercial Classes, Bombay.

The Technological Assistants working in the mofussil laboratories attended the Laboratory in November/December 1941 for the annual refresher course and the Conference between them and the Research Assistants of the Laboratory. This Conference was held on the 28th and 29th November 1941. It may be mentioned in this respect that the Indian Central Cotton Committee at its meeting held in January 1941 decided that an Agronomist from a nearby station should attend this Conference. In pursuance of this decision Rao Bahadur S. S. Salimath, Deputy Director of Agriculture, Gujerat, Surat, was

deputed by the Director of Agriculture, Bombay Presidency, to attend the Conference. He took a keen interest in the deliberations of the Conference and his presence was very helpful.

Equipment.—The following apparatus have been added to the equipment of the Laboratory :—

(1) One Bursting Strength Tester manufactured by Messrs. Goodbrand & Co., Ltd., Stalybridge, England.

(2) One Strobotac with Transformer for speed measurement.

(3) An improved type of quartz micro-balance has been designed by Mr. Nanjundayya. On trial it has been found to work in a satisfactory manner and give more consistent readings than a torsion balance.

Staff.—Full details of the technical staff employed at the Laboratory are given in Appendix I, while details regarding leave, transfer, temporary appointments, etc., are given below.

Leave.—The writer proceeded on leave on private affairs from the 18th August 1941 to 22nd October 1941. During this period Mr. D. L. Sen officiated as Director of the Laboratory.

Mr. D. L. Sen, Senior Research Assistant, proceeded on leave from the 13th April 1942 to the 30th May 1942.

Mr. R. S. Koshal, Senior Research Assistant, proceeded on leave from the 27th April 1942 to the 13th June 1942.

Mr. V. V. Gupte, Spinning Master, proceeded on leave from the 4th May 1942 to the 13th June 1942, and during his absence Mr. A. G. N. Iyengar officiated as Spinning Master.

Transfer and Appointments.—Mr. D. L. Sen, Senior Research Assistant, continued to hold the office of the Superintendent, Testing House, in addition to his own duties.

Captain G. J. Kharkar, Junior Tester, continued to be on military duty during the period under review and the officiating arrangement previously made was continued.

Mr. P. D. Vakil, Junior Tester, continued to be on duty in the Indian Stores Department, and the officiating arrangement previously made was extended.

In order to cope with the heavy increase of work in connection with the samples received from the Indian Stores Department and the cotton mills, the following temporary appointments were made :—

1.	Mr. S. S. Rangan,	Junior Tester.
2.	,, M. Ramchandra Rao,	,, ,,
3.	,, B. A. Nabar,	,, ,,
4.	,, M. S. S. Naidu,	,, ,,
5.	,, R. F. Patil,	,, ,,
6.	,, G. G. Wagle,	,, ,,

7.	Mr. Y. N. Yardi,	Junior Tester.
8.	,, Y. S. Rajadhyaksha,	,, ,,
9.	,, S. B. Basak.	,, ,,

When the arrangement with the Indian Stores Department for testing the development samples and samples submitted against tenders was terminated in December 1941, the Junior Testers on duty on behalf of the Indian Stores Department were transferred to the office of the Inspector of Textiles, Indian Army Ordnance Corps, Bombay.

I regret to report that Mr. Y. S. Rajadhyaksha who was appointed as a Junior Tester in the Laboratory in connection with the I.S.D. work died in August 1941 after a short illness. The post was filled up by the appointment of Mr. R. B. Nayampalli.

The Board of Scientific and Industrial Research has sanctioned a scheme to be carried out at the Laboratory for estimating the alfa-cellulose content of Indian raw materials. Mr. M. G. Karnik was appointed to the post of a Research Assistant in this scheme, which is being financed by the Board.

The Agricultural Marketing Adviser to the Government of India has requested that tests may be made on a number of Agmark cottons with a view to laying down certain criteria for quality. The Committee has approved the carrying out of these tests at the Laboratory, the scheme being financed by the Central Marketing Department. In connection with this scheme, Messrs. S. W. Saeed, V. S. Shete and S. K. Kapre have been appointed temporary Junior Testers for a period of four months.

Messrs. S. M. Hyam, G. K. Joglekar, Nazir Ali and V. G. Rajah were selected for training in the elements of cotton technology and fibre and yarn testing and joined the Laboratory on the 19th January 1942. Mr. V. G. Rajah left the Laboratory in April 1942 for private reasons and Mr. P. B. Tata was admitted.

ACKNOWLEDGMENTS.

I wish to express my thanks to the office-bearers of the Indian Central Cotton Committee for their valued support and interest in all matters relating to the Laboratory. My thanks are also due to the staff of the Laboratory without whose co-operation the work described in this report would not have been possible. I am also grateful to Mr. Purshotamdas Harkisondas of Messrs. Bhaidas Cursondas & Co., Bombay, for the valuable help given by him in grading the large number of samples received for tests at the Laboratory.

(Sd.) NAZIR AHMAD,
Director,
Technological Laboratory,
Matunga, Bombay.

Dated, the 19th June 1942.

APPENDIX I.

LIST OF SCIENTIFIC AND TECHNICAL STAFF OF THE TECHNOLOGICAL LABORATORY AS ON 31ST MAY 1942.

	Designation.	Name.	Remarks.
1.	Director	Dr. Nazir Ahmad, O.B.E., Ph.D., F.Inst.P.	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga.
2.	Senior Research Assistant (Chemist) and Superintendent, Testing House.	Mr. D. L. Sen, M.Sc., Tech. (Manch.), M.Sc. (Bomb.), A.I.I. Sc., F.I.C.	Research Student of the Indian Institute of Science and Manchester College of Technology.
3.	Senior Research Assistant (Physicist)..	Mr. N. Hari Rao, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory (Textile Physics).
4.	Senior Research Assistant (Physicist) ..	Mr. R. S. Koshal, M.Sc. (Punjab)	Do. do.
5.	Temporary Chemist	Dr. L. Thoria, Dr. Ing. (Germany) ..	....
6.	Spinning Master	Mr. V. V. Gupte, B.Sc., Tech. (Manchester) B.Sc. (Bombay).	....
7.	Junior Research Assistant (Microscopist)	Mr. A. N. Gulati, M.Sc. (Punjab)	Imperial Institute of Veterinary Research, Mukteshwar, U.P.
8.	Statistician and Personal Assistant ..	Mr. V. Venkataraman, M.A. (Madras) ..	Statistical Assistant, Labour Office, Government of Bombay.
9.	Junior Research Assistant (Physicist)	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory (Textile Physics).
10.	Do. (Physicist)..	Mr. R. L. N. Iyenger, M.Sc. (Madras) ..	Research Scholar, Technological Laboratory and Technological Assistant, Coimbatore.
11.	Head Tester	Mr. H. B. Joshi, B.Sc.	....
12.	Senior Tester	Mr. S. S. Sukthanker, L.T.C. (V.J.T.I.) ..	....
13.	Junior Tester	Mr. G. D. Bhide, B.Sc.	....

APPENDIX I—(*contd.*)

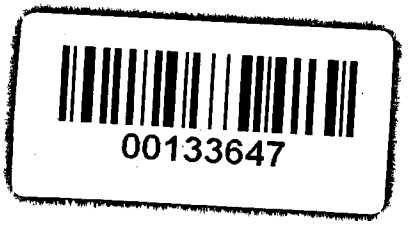
LIST OF SCIENTIFIC AND TECHNICAL STAFF OF THE TECHNOLOGICAL LABORATORY AS ON 31ST MAY 1942—*continued.*

	Designation.	Name.	Remarks.
14.	Junior Tester	Mr. K. V. N. Nayar	....
15.	Do.	Mr. V. N. Modak, B.Sc.	....
16.	Do.	Mr. L. V. Sundararaman, B.A.	....
17.	Do.	Mr. P. S. Sambamurthi	....
18.	Do.	Mr. R. G. Panvalkar, B.Sc.	....
19.	Do.	Mr. G. J. Kharkar, B.Sc.	....
20.	Do.	Mr. A. J. Farid	(On military duty).
21.	Do.	Mr. P. V. Nachane, B.Sc.	....
22.	Do.	Mr. C. S. Ramanathan, B.Sc.	....
23.	Do.	Mr. B. N. Prabhakar, M.Sc.	....
24.	Do.	P. D. Vakil	....
25.	Do.	Mr. S. B. Mogre, M.Sc.	(Lent to I. S. D.)
26.	Do.	Mr. R. B. Joshi, B.Sc.	....
27.	Junior Tester (Officiating)	Mr. C. A. S. Iyer, B.Sc.	....
28.	Do. do.	Mr. M. Bhaskerrao	....
29.	Do. do.	Mr. S. Ramanathan	....
30.	Do. do.	Mr. N. C. Chiplonkar, B.Sc.	....
31.	Do. do.	Mr. T. R. Krishnamurthy, B.Sc.	....
32.	Do. (Temporary)	Mr. S. W. Saeed, M.Sc.	....
33.	Do. do.	Mr. V. S. Shete, B.Sc.	....
34.	Do. do.	Mr. S. K. Kapre, M.Sc.	....
35.	Gin Supervisor	Mr. G. G. Oka	....
36.	Statistical Clerk	Mr. R. Krishna Iyer	....
37.	Do.	Mr. P. K. Wagle	....
38.	Electrician	Mr. H. Lobo, L. E. E. (V. J. T. I.) ..	....
39.	Spinning Assistant	Mr. A. G. N. Iyengar	....
40.	Draughtsman	Mr. B. G. Mehta	....
41.	Mechanic	Mr. J. B. Kharas	....

INDIAN CENTRAL COTTON COMMITTEE.

With the Secretary's compliments.

Vulcan House, Nicol Road,
Ballard Estate,
Fort, Bombay.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